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# Investigating Knowledge Transfer During the Departure of a Project Member in the Semiconductor Industry

A Case Study Applying the Ability-Motivation-
Opportunity Model

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## Problem Description

Knowledge is critical to the success of projects, and knowledge loss can affect the project negatively. Knowledge loss can occur when a project member departs mid-project. While there is much theory revolving around continuous knowledge sharing within companies, no comprehensive model has been developed that focuses specifically on knowledge transfer when a project member departs a project. Thus, the question becomes, how can knowledge sharing theory be applied to knowledge transfer, specifically in the semiconductor industry?

# Preface

The idea for this thesis is based on my previous work experience. When I left my former company to pursue a Master's degree, I left several projects simultaneously. I put much effort into documenting as much knowledge as possible, so my successor would be able to transition seamlessly into my role. While I am told my efforts have helped more project members than just my replacement, there was also much knowledge I was unable to transfer and I had to be contacted after my departure to resolve issues.

Being an engineer who is always looking for processes to improve or automate, I figured there must be a way to improve the process of knowledge transfer when a project member exits a project. I hope that the result of my thesis can be successfully applied to similar situations, benefiting all parties involved.

I acknowledge the cooperation of the interviewees who were willing to participate in my research, as it would have been impossible to gain an understanding of different perspectives without their input. I also thank Ola Edvin Vie for providing superior guidance during the formulation of my research question and the thesis writing process.

# Abstract

The purpose of this thesis is to investigate how knowledge is transferred when a project member leaves a project before the project has been completed and how this process can be improved. Knowledge sharing theories present many factors and models to explain knowledge sharing. Although these theories tend to treat sharing and transfer as interchangeable, my research shows that knowledge sharing is a continuous process, while knowledge transfer occurs over a limited period of time when a project member leaves a project. This difference makes for interesting research in the fields of both knowledge and project management, where such situations are left unaddressed.

In my research, I apply the most important and most discussed factors as well as the Ability-Motivation-Opportunity (AMO) model to a case study in the semiconductor industry and show that this model and most factors also apply to knowledge transfer.

The thesis answers the following research question:

> *How do the factors of the AMO model for knowledge sharing apply to knowledge transfer during the departure of a project member in the semiconductor industry?*

Using a semi-structured interview guide, I gather data through interviews with eight project members in the semiconductor industry who have been both senders and receivers of knowledge in transfer situations. Comparing these findings to the theoretical propositions I construct about knowledge transfer, based on knowledge sharing theories, shows that some factors are more relevant than others and some do not apply at all to knowledge transfer. I conclude that drive, relationships, cooperation, and priorities have a high impact on knowledge transfer; language, competence, trust, withholding, access, and time have a slight impact on knowledge transfer; and hierarchies and incentives do not apply to knowledge transfer scenarios in the semiconductor industry. The new model I develop specifically for knowledge transfer in projects in the semiconductor (MOAT) reflects this ranking of factors.

# Summary

This thesis presents theory about factors relating to knowledge sharing and applies it to knowledge transfer. The model used to structure the research is the Ability-Motivation-Opportunity model. The product of the thesis is a new model specific to knowledge transfer in the semiconductor industry. The purpose of the model is to help project managers focus their resources on certain factors that positively influence knowledge transfer in a situation where a project member departs from the project and a new member joins.

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# 1. Introduction

Project management generally entails running projects within scope, cost, and quality constraints. While resource allocation, such as the number of employees in a project, is within the scope of project management, the effects personnel turnover can have on a project are often ignored, because they are not well understood or easy to manage. One of the side effects of personnel turnover in a project is the loss of knowledge, because knowledge is often stored in individuals in the form of tacit knowledge (see Chapter 2.1.2 Tacit Knowledge) and leaves the project with the employee if it is not documented or transferred to someone else. Since knowledge loss can often affect the project negatively, project managers need to be aware of what these negative effects can be and how they can avoid knowledge loss during the replacement of project members.

Theory states that one method of increasing the retention of knowledge is to promote knowledge sharing practices during the lifetime of the project. Project members are encouraged to share knowledge with their fellow project members to create redundancy in knowledge storage. This method is meant to ensure that when a project member leaves a project before the project has been completed, knowledge is not lost, because other project members have already absorbed it and can continue to use it.

Although knowledge sharing and knowledge transfer are often used interchangeably in literature, they are quite different. Knowledge sharing is a continuous process (see Chapter 2.2.1 Knowledge Sharing), while knowledge transfer occurs over a limited period of time when a project member leaves a project (see Chapter 2.2.2 Knowledge Transfer). This difference is particularly evident in the semiconductor industry. Due to the specificity and non-redundancy of each project member's tasks in a project, it makes no sense to continuously share knowledge that is only applicable to one's own tasks. This knowledge is only ever transferred once to a replacement project member. There are also certain limitations that apply to knowledge transfer that can make it difficult to implement. These restrictions are rarely considered in literature related to knowledge sharing, because these restrictions are specific to the event of the departure of someone who holds knowledge.

Theory discusses many factors that influence knowledge sharing (see Chapter 2.4 Knowledge Movement Factors). Literature suggests that all factors apply equally to knowledge transfer as they do to knowledge sharing, because no distinction is made between these two types of knowledge movement. In this thesis, I investigate theory about these factors in knowledge

transfer situations in the semiconductor industry (see Chapter 1.1 Importance of Research Question) in order to determine whether these factors do, in fact, apply to knowledge transfer in addition to applying to knowledge sharing.

In order to investigate this problem methodologically, I use the Ability-Motivation-Opportunity (AMO) model, a model used to describe knowledge sharing (see Chapter 2.3 The Ability-Motivation-Opportunity Model), to structure twelve different factors that theory claims affect knowledge sharing. I deem the AMO still applicable to knowledge transfer as long as each of the three categories has at least one factor remaining in it by the end of my analysis. Otherwise, the basic structure of the AMO model is irrelevant to knowledge transfer.

### Research Question

I take the stance in this thesis that knowledge transfer differs from knowledge sharing, even though literature often assumes these two modes of knowledge movement are the same, and that restrictions affecting knowledge transfer are not taken into account in knowledge sharing theories. In this thesis, I compare knowledge sharing theories to empirical data about knowledge transfer obtained from the semiconductor industry.

Specifically, I investigate how the twelve factors (see Chapter 2.4 Knowledge Movement Factors) associated with the AMO model for knowledge sharing (see Chapter 2.3 The Ability-Motivation-Opportunity Model) apply to knowledge transfer.

> *How do the factors of the AMO model for knowledge sharing apply to knowledge transfer during the departure of a project member in the semiconductor industry?*

## 1.1 Importance of Research Question

In Chapter 1.1 Importance of Research Question, I present the context of the research question. The three main topics here are project management, knowledge management, and the semiconductor industry.

### Project Management

The field of study within which my research operates is project management. Among other authors, Nesheim and Smith (2015, p. 1418) define projects as "temporary organizations". The managing of such projects (i.e. project management) is further defined as "the management of a temporary task" (Nesheim and Hunskaar, 2015, p. 1417; Nesheim and Smith, 2015, p. 255). The time span of this temporary task can vary, however, and depending on what happens during

this time period, the amount of knowledge within the project may increase or decrease. One would normally expect the knowledge within the project to be greater at the end of the project than at the beginning, but there are many ways that a project may lose knowledge as well. A project cannot function without some level of knowledge, so project management and knowledge management, another important field of study for my research, should go hand-in-hand (Jafari et al., 2011; Leseure, 2004).

## *Knowledge Management*

The other major field linked to project management and related to my research is knowledge management. Many authors agree that knowledge management is a social process, since projects involve people (Mason, 2003; Quigley et al., 2007). It can be defined as "the systematic and explicit management of knowledge related activities, practices, programs and policies within the enterprise" (Mason, 2003, p. 38). Moonaghi et al. (2014, p. 1) describe knowledge management as "a series of coordinated, precise, and continuous efforts to manage organizational knowledge and to leverage it." Leveraging knowledge management is to make use of the knowledge, usually to obtain some sort of benefit, such as competitive advantage in the industry. "In its simplest form, knowledge management is about encouraging people to share knowledge and ideas to create value-adding products and services" (Leseure, 2004, p. 104).

Knowledge management involves some form of knowledge movement, such as sharing or transfer, as well as knowledge storage (Moonaghi et al., 2014). Knowledge movement, described in more detail in Chapter 2.2 Knowledge Movement, is the flow of knowledge between individuals, organizational units, or even separate companies. As for knowledge itself, although some knowledge, in particular explicit knowledge (see Chapter 2.1.1 Explicit Knowledge), can be stored in databases and other mediums, some knowledge is automatically stored in employees. Knowledge management involves activities such as monitoring the location and flow of knowledge and extracting internal knowledge to make it available to everyone who could benefit from it.

Knowledge and knowledge management contribute significantly to an organization's sustainable competitive advantage. Meanwhile, loss of knowledge can impact projects negatively, and consequently, also affect many aspects of the company in negative ways. "Firms cannot build and maintain an advantage if their most valuable knowledge assets simply 'walk out the door' to go to work for competitors or to start their own companies" (Ranft and

Lord, 2000, p. 298). It is the physical departure of project members that can cause knowledge loss. Unfortunately, many companies do not take knowledge residing within employees seriously and do not consider this knowledge particularly valuable (Joia and Lemos, 2010).

Not all is lost when a project member leaves a project, however; there are many ways to reduce the amount of knowledge loss that may occur. In an ideal world, an employee would remain in the project until its completion. However, due to the unpredictability of reality, this consistency in employee retention throughout the course of a project is not guaranteed. In the event that an employee does transfer out of the project, measures need to be in place for the employee's knowledge to be moved to someone who can continue to make use of it during the project.

Cultivating continuous knowledge sharing (see Chapter 2.2.1 Knowledge Sharing) is one method of ensuring the retention of knowledge. The movement of knowledge within the project or organization while the employees are still there can help reduce the negative impact that a departing employee may have on the project or organization. "Sharing [of knowledge] may be particularly pertinent when there is a risk that highly knowledgeable employees may leave the organization" (Foss et al., 2009, p. 871).

While this continuous movement of knowledge would be the recommended strategy for knowledge loss mitigation, this is not the focus of my research. I specifically investigate how knowledge is moved during the period between when the project member announces the intended departure until the knowledge movement is complete or the project member departs. This is considered knowledge transfer (see Chapter 2.2.2 Knowledge Transfer).

As mentioned previously in Chapter 1 Introduction, knowledge transfer has restrictions that knowledge sharing does not have. One obvious restriction is a time limit for moving the knowledge. Other factors are investigated throughout this thesis (see Chapter 2.4 Knowledge Movement Factors).  First, however, I discuss how my research fits into the semiconductor industry, since these restrictions may vary across different industries.

### The Semiconductor Industry

Finally, the details of the industry in which my research takes place requires elaboration. As already alluded to in Chapter 1 Introduction, I believe the semiconductor industry requires both knowledge sharing and knowledge transfer, but also makes a clear distinction between these two processes. Thus, it provides an excellent environment for my research.

The semiconductor industry is rather large. The Semiconductor Industry Association states that in 2016, the worldwide sales were 338.9 billion USD (SIA, 2017). The semiconductor industry

produces integrated circuits which are used in a variety of applications in sectors such as automotive, communications, computer, industrial, and consumer (SIA, 2017).

From personal experience, I know that projects involving integrated circuits use both standardized processes and new developments. Standardized processes utilize mainly documented, i.e. explicit, knowledge (see Chapter 2.1.1 Explicit Knowledge), while new developments rely mainly on knowledge embedded within project members, i.e. tacit knowledge (see Chapter 2.1.2 Tacit Knowledge). However, this industry is high-tech, fast-paced, and highly innovative, so much of the knowledge created and used in a project may be left undocumented due to time constraints.

Another constraint is that project members generally specialize in certain fields. Due to the specialization of positions in such projects, knowledge sharing may not be as effective as in other industries. For instance, although both may be working on the same project, it is unlikely that a design engineer will share knowledge with a marketer, because the marketer has no need for the design engineer's knowledge and probably will not understand it.

This potential lack of knowledge sharing makes knowledge transfer incredibly important in the semiconductor industry. When a project member leaves a project, a new member is usually hired to replace him or her. The knowledge transfer that occurs between these two members during the overlap period of employment ensures that the former member's knowledge remains within the project.

## 1.2 Thesis Structure

Figure 1 visualizes the core of the structure of this thesis. In the following paragraph, I explain all the chapters of this thesis, including those not shown in Figure 1 and how they are linked together.

I begin my research in Chapter 2 Theoretical Foundation by examining the literature related to my main research question and create propositions for how knowledge sharing concepts might apply to knowledge transfer. Following the theoretical foundation, my methodology is detailed in Chapter 3 Methodology. After presenting my methods for collecting data, I summarize my empirical findings in Chapter 4 Empirical Findings. The analysis in Chapter 5 Analysis then compares my propositions from Chapter 2 Theoretical Foundation to the data from Chapter 4 Empirical Findings to determine if these statements apply to knowledge transfer. I use this data to modify my propositions for each of the twelve factors of the Ability-Motivation-Opportunity (AMO) model to reflect the knowledge transfer phenomenon. I then rank the factors from most

impactful to least impactful on knowledge transfer in Chapter 6 Discussion. I use these results to construct a new model for knowledge transfer. Finally, in Chapter 7 Conclusion, I summarize my findings and contributions, discuss how they are relevant to project managers, and propose ideas for future research.

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**1.0 Research Question**
How do the factors of the AMO model for knowledge sharing apply to knowledge transfer during the departure of a project member in the semiconductor industry?

⬇

**2.0 Theoretical Foundation**
Presents AMO model with relevant factors for knowledge sharing as given in theory and states propositions for how the factors could relate to knowledge transfer.

⬇

**5.0 Analysis**
Compares propositions to empirical findings.

⬇

**6.0 Discussion**
Ranks factors from most impactful to least impactful and proposes a new model for knowledge transfer.

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Figure 1 Visual Representation of the Structure of the Thesis

# 2. Theoretical Foundation

In Chapter 1.1 Importance of Research Question, I explain the context for the research question and also present arguments for why knowledge retention is important. Here in Chapter 2 Theoretical Foundation, I present theory about a knowledge sharing model and how I believe it can be applied to knowledge transfer.

The structure of my research centers around the Ability-Motivation-Opportunity (AMO) model, as described by Argote et al. (2003). Before I introduce this model in Chapter 2.3 The Ability-Motivation-Opportunity Model, however, I first go into more detail about what knowledge is (see Chapter 2.1 Theories of Knowledge) and what types of knowledge movement are relevant to my research (see Chapter 2.2 Knowledge Movement), since an understanding of these topics is a prerequisite for understanding how I apply the AMO model to my research. Finally, in Chapter 2.4 Knowledge Movement Factors, I present theory about factors of knowledge sharing relevant to the AMO model as found in literature. Based on what theory says about knowledge sharing, I create propositions for how each factor in the AMO model can apply to knowledge transfer in the situation suggested by the research question. I later compare these propositions to my empirical findings from Chapter 4 Empirical Findings to determine if they are indeed applicable to knowledge transfer.

## 2.1 Theories of Knowledge

The following chapter defines what knowledge is and presents different types of knowledge based on what literature has already defined. At the end of this chapter, I summarize the different types of knowledge and specify which type of knowledge is relevant for the research question.

In order to understand what knowledge is, it is helpful to compare it to the term "information." Nonaka (1994, p. 15) describes information as "… a flow of messages, while knowledge is created and organized by the very flow of information, anchored on the commitment and beliefs of its holder". Nonaka (1994) then goes on to say that knowledge involves human action. Conversely, information does not have a human component, because it is purely factual with no interpretation. Knowledge is the meaning an individual interprets from the information (Newell, 2002). Similarly, Jafari et al. (2011) state that "knowledge is information in practice; it is a kind of personal information."

Essentially, knowledge can be derived from experiences. Sometimes it can be stored in systems that allow it to be retrieved by someone else, but more often it is stored within a person who must make an effort to convey the knowledge to someone else who will then be able to make use of it as well. The latter is what this thesis focuses on: the transfer of knowledge stored within a departing member to a new member who requires it.

Knowledge has multiple dimensions. Researchers agree that there are two main types of knowledge: tacit and explicit (D'Eredita and Barreto, 2006; Moonaghi et al., 2014; Tsoukas, 2002). It is important to make a distinction between the two, since different types of knowledge may be treated differently when it comes to knowledge movement. Although these two terms are widely used, upon further scrutiny, I find that at least tacit knowledge seems to have a variety of different meanings in literature.

## 2.1.1 Explicit Knowledge

Explicit knowledge has a straightforward and agreed-upon definition: "'explicit' or codified knowledge refers to knowledge that is transmittable in formal, systematic language" (Nonaka, 1994, p. 16). Other authors agree with this definition, citing examples such as words and symbols stored in databases (Joia and Lemos, 2010), procedures and documented instructions (Oyemomi et al., 2016), and manuals and blueprints (Ranft and Lord, 2000) as forms of explicit knowledge. In other words, it is knowledge that can be passed on clearly without it losing its meaning or becoming distorted. Of course, there is always room for interpretation, but in theory, explicit knowledge is treated as something that can be clearly expressed and transmitted between two parties through some concrete form of communication, such as written material. Additionally, direct interaction between the two parties is not required, since the written knowledge can be accessed through a database, for example.

## 2.1.2 Tacit Knowledge

As for tacit knowledge, Schindler and Eppler (2003, p. 2) state that tacit knowledge encompasses "… 'know-how' (procedural or heuristic knowledge) and especially 'know-why' (e.g. experiences, insights into cause-effect relationships)". The "know-how" is the knowledge of methods, procedures, or individual tasks needed in order to successfully perform a larger task. The "know-why" is equally important, as it provides the context for the task and can give meaning to it as well. Nonaka (1994, p. 16) concurs by defining tacit knowledge as having a "personal quality, which makes it hard to formalize and communicate".

Despite the difficulty of converting tacit knowledge into something that can be communicated, Nonaka (1994) maintains that it is possible. However, not everyone agrees with this. In fact, Tsoukas (2002, p. 16) criticizes this view and argues that "tacit knowledge cannot be 'captured', 'translated', or 'converted' but only displayed, manifested, in what we do." Although Reagans and McEvily (2003, p. 245) do not agree that tacit knowledge cannot be converted, they do state that "in some cases, tacit knowledge can only be transferred through up-close observation, demonstration, or hands-on experience", which means it is not documented as explicit knowledge. This indicates that tacit knowledge may have to be transferred directly without an intermediate conversion process. Therefore, while tacit knowledge in general is simply undocumented knowledge gained through experiences and resides within a person, how and if tacit knowledge is communicated remains debatable.

In short, many authors, including Nonaka (1994), Schindler and Eppler (2003), and Reagans and McEvily (2003) believe that tacit knowledge can be converted, although it can be difficult. Meanwhile, Tsoukas (2002) argues that tacit knowledge can never be converted into an explicit form.

Since my research reveals that there appear to be varying definitions of tacit knowledge, I propose two separate definitions for two types of tacit knowledge for the sake of clarity. The three statements given in Table 1 below give my proposed definitions to be used throughout this thesis.

Table 1 Knowledge Types

| Knowledge Type | Definition |
|---|---|
| Explicit knowledge | Knowledge which can be communicated through a non-personal medium without losing its meaning |
| Tacit knowledge (Type 1) | Knowledge within an individual that is waiting to be explicitly expressed in documented form |
| Tacit knowledge (Type 2) | Knowledge within an individual that remains uncodified indefinitely and can only be expressed through demonstration |

Since this thesis revolves around the interaction between two parties during a transfer, the knowledge focused on is tacit knowledge. In particular, type 2 tacit knowledge is the main focus, since I look at which factors facilitate the transfer of knowledge that is generally not documented and that requires personal interaction to enable transfer.

## 2.2 Knowledge Movement

In this thesis, I refer to knowledge sharing and knowledge transfer collectively as knowledge movement. The term knowledge movement is not commonly found in literature, but I find it useful when making a distinction between general knowledge movement and the two specific types of knowledge movement. Knowledge sharing and knowledge transfer are often used interchangeably in literature even though there is a significant difference between them. The Ability-Motivation-Opportunity (AMO) model I use in this thesis specifically refers to knowledge sharing, and the intent of this thesis is to apply it to knowledge transfer. Thus, I present clear definitions of sharing and transfer in Chapter 2.2.1 Knowledge Sharing and Chapter 2.2.2 Knowledge Transfer, respectively.

### 2.2.1 Knowledge Sharing

The first of the two terms discussed is knowledge sharing. This is the term that is used by Argote et al. (2003) when they introduce their AMO model (see Chapter 2.4 Knowledge Movement Factors). In the following chapter, I present various definitions of knowledge sharing based on the views of a variety of authors, ending with the definition I use for this thesis.

Knowledge sharing is a part of knowledge management (Navimipour and Charband, 2016) and is defined as the movement of knowledge on a personal level (i.e. between employees) (Wang and Noe, 2010), sometimes in a bidirectional (Foss et al., 2009; Gagné, 2009) but mainly in a unidirectional manner (Wang and Noe, 2010).

Knowledge sharing is a very social activity. "In a project setting where people work together and interact closely, issues of knowledge sharing are considered important" (Navimipour and Charband, 2016, p. 731). The main characteristic of knowledge sharing is that it converts individual knowledge to organizational knowledge (Foss et al., 2009; Nesheim and Hunskaar, 2015; Nesheim and Smith, 2015).

Oyemomi et al. (2016) also conclude that knowledge sharing is a social process in that it is more of a collaboration among employees rather than a simple movement of knowledge with no follow-up. Oyemomi et al. (2016, p. 5223) go on to state that "knowledge sharing is a continuous, interactive process", implying that it is not a one-time event. It is an ongoing process that increases organizational knowledge through the sharing of knowledge at a lower level within the organization.

Literature does not provide a single comprehensive definition of knowledge sharing. Rather, the term is defined through examples of its usage. At this point, I would like to return to the dictionary definition of the word "share". Although the English dictionary is an unconventional reference to use in a thesis such as this, I believe it is helpful to return to the original definitions of certain words in order to confirm that the definitions discussed in this thesis do not stray far from the intended use of the word.

In the context of knowledge, the most suitable definition of sharing would be "to tell thoughts, feelings, experiences, etc. to others" (Merriam-Webster, 2017). The definitions presented in literature are very similar to this definition. Neither theory nor the dictionary definition mentions that the sender no longer using the knowledge after having shared it with the recipient. Since literature does not settle on any particular definition, I propose the following definition of knowledge sharing in the context of the research question and AMO model, described in Chapter 2.3 The Ability-Motivation-Opportunity Model:

> *Knowledge sharing is the continuous movement of knowledge from the sender to the receiver, where the sender may continue to use the knowledge after having shared it.*

In the context of a project, knowledge sharing results in multiple project members possessing the same knowledge, creating redundancy in the storage of knowledge. In such a situation, knowledge sharing can be seen as a sort of risk management of knowledge. It ensures that the knowledge of a project member is stored somewhere, even if it is just within another person, so if that project member leaves the project, the knowledge is still available within the project.

## 2.2.2 Knowledge Transfer

In order to define the second type of knowledge movement referred to in this thesis, it is important to note how it, knowledge transfer, compares to knowledge sharing, previously described in Chapter 2.2.1 Knowledge Sharing. The following chapter examines knowledge transfer in more detail.

Although the term knowledge transfer is often used interchangeably with knowledge sharing, it is quite different (McNeish and Singh Mann, 2010; Mühl, 2014; Wang and Noe, 2010). Foss et al. (2009, p. 460) state that many sources label knowledge transfer as the "ultimate outcome of the 'knowledge sharing' process", which indicates that the two terms are not the same. Rather, one is part of the other. To quote McNeish and Singh Mann (2010, p. 19), "knowledge transfer is about the ability to take action (transfer) based on knowledge" while "knowledge

sharing [is] about the exchange of the knowledge between two people." This seems to indicate that transfer is a single act during the sharing process.

Meanwhile, Szulanski (2000) claims that knowledge transfer is not, in fact, an act, but rather a process, indicating that transfer resides within the knowledge sharing process as a sub-process. Wang and Noe (2010, p. 117) take it one step further, saying that "knowledge transfer involves both the sharing of knowledge by the knowledge source and the acquisition and application of knowledge by the recipient." This statement includes the action of application by the receiving unit. Thus, transfer appears to be not simply an act or process that occurs between the two interacting parties. Transfer also includes the act of applying the transferred knowledge.

One of these explanations of what knowledge transfer as a process is, states that transfer is a process that allows one unit, such as a division within a company, to be affected by the experience of another (Argote and Fahrenkopf, 2016; Argote and Ingram, 2000). This indicates that the first unit either possesses information that the second unit does not have or applies knowledge both units share in a different way. Either way, the second unit learns from the experience of the first by either accepting new knowledge or learning to apply its current knowledge in a way described by the first unit.

Szulanski et al. (2004, p. 601) make a similar statement: "knowledge transfer is often undertaken to reproduce superior results observed elsewhere within the organization." Here it is made clearer that the knowledge is transferred because it is seen as having a positive effect on the functioning of the organization, such as increasing competitive advantage (see Chapter 1.1 Importance of Research Question).

Meanwhile, the dictionary defines transfer as "to convey from one persona, place or situation to another" and also "to cause to pass from one to another" (Merriam-Webster, 2017). This is in line with most of the definitions found in literature. However, there is another definition that I believe makes it very clear that transfer is different from sharing: "to make over the possession or control of" (Merriam-Webster, 2017). This means that the knowledge that is transferred "leaves" the sender because the sender no longer needs this knowledge. This is exactly what occurs when a project member leaves the project. The departing member will no longer need the knowledge in the context of the project and therefore leaves it behind, so to speak.

However, this contradicts what Wang and Noe (2010) say about how transfer includes the process of applying the knowledge, since the dictionary definition indicates that the transfer process ends once the transfer of knowledge is complete.

Given the differences between the definition of knowledge transfer found in literature and the definition as stated in the English dictionary, I propose the following statement, which makes the difference between the two types of knowledge movement very clear and also becomes more relevant to my research:

> *Knowledge transfer is one-time movement of knowledge between the sender and receiver, where the sender no longer needs or will use the knowledge after the transfer process.*

Again, in the context of a project, when a project member leaves a project, he or she transfers responsibility to the new project member. This includes transferring relevant knowledge. Even though the departing member may use some of his or her knowledge in a future project, he or she will no longer apply it to the previous project, because the project member will have left that project.

To recap, the AMO model applies to knowledge sharing, which is a continuous process where both the sender and receiver make use of the knowledge. The research question aims to apply the AMO model to a knowledge transfer scenario, in which there is a short period of transaction time where the sender transmits knowledge to the receiver. Since the departing project member (i.e. sender) leaves the project following the transfer, responsibility for using the knowledge then falls on the receiver, meaning that the sender no longer uses the knowledge in the context of the project.

## 2.3 The Ability-Motivation-Opportunity Model

Now that both knowledge sharing and knowledge transfer are defined, the Ability-Motivation-Opportunity (AMO) model can be introduced.

The Motivation-Ability model was first introduced by Vroom (1964) as a way to characterize work performance. Later, Blumberg and Pringle (1982) added opportunity to the model, arguing that it was also an important driving factor for work performance. Argote et al. (2003) apply this same model to knowledge management. The model was not developed for any particular industry; it is a basic model for organizations in general. Just as Argote et al. (2003) apply this work performance model to another field (i.e. knowledge management), I take it one step further and apply it to yet another more specific field: knowledge transfer in projects in the semiconductor industry.

Argote et al. (2003) present the model as a model of successful knowledge sharing that involves all three main mechanisms of knowledge sharing (i.e. ability, motivation, and opportunity), claiming that these terms summarize all factors needed for optimal knowledge sharing. The AMO model, sometimes also referred to as the MOA model, is used frequently throughout literature to describe knowledge sharing practices within the field of knowledge management. In this thesis, I will refer to it as the AMO model, since this is the order in which Argote et al. (2003) present the three categories. Figure 2 below visually depicts the AMO textually described by Argote et al. (2003).
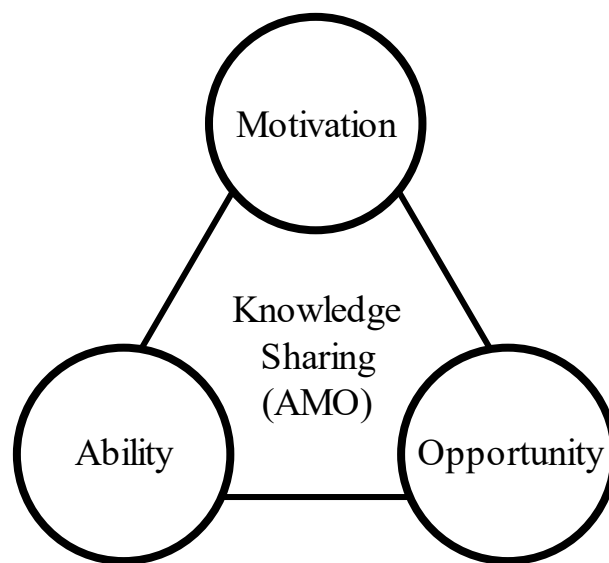


Figure 2 AMO Knowledge Sharing Model as Described by Argote et al. (2003)

Each of these mechanisms encompasses multiple factors that affect knowledge sharing. Argote et al. (2003) mention some of these in their description of the AMO model. In Chapter 2.4 Knowledge Movement Factors, I add several factors to the model that are found elsewhere in literature. First, however, I briefly present definitions of ability, motivation, and opportunity as given by Argote et al. (2003).

*Ability*

Having the skills to communicate is clearly a prerequisite to successful knowledge sharing. Argote et al. (2003) argue that possessing the training to share knowledge is vital. Additionally, the authors state that having the right background on which to build the knowledge is a key factor. Related to that is the importance of a common language used between the two parties engaged in knowledge sharing. These aspects of ability are discussed in more detail in Chapter 2.4.1 Ability.

*Motivation*

Argote et al. (2003) say that motivation entails mainly rewards and incentives that help encourage the parties involved to share their knowledge. This could include both monetary and personal rewards. Being cooperative about sharing is important and those sharing knowledge are often motivated by trying to maintain a good professional and personal reputation. More types of rewards and other factors for motivation are discussed in Chapter 2.4.2 Motivation.

*Opportunity*

As for opportunity, Argote et al. (2003) specifically emphasize the importance of locality, i.e. reducing the physical distance between the knowledge sharing parties. Essentially, the sender must have access to the receiver and vice versa. The authors also state that knowledge is gained through experience such as trial-and-error learning. How this type of learning translates to the factors I investigate is discussed in Chapter 2.4.3 Opportunity.

## 2.4 Knowledge Movement Factors

As already alluded to in Chapter 2.3 The Ability-Motivation-Opportunity Model, there are many factors that influence knowledge movement. The following chapters present a total of twelve factors I choose to examine in regard to the research question. The factors are a combination of those presented by Riege (2005) and some presented by other authors, such as priorities discussed by Hansen et al. (1999) and the factors Argote et al. (2003) discuss in the Ability-Motivation-Opportunity (AMO) model. Additionally, I placed each factor in one of the three categories of the AMO model.

There are some factors that I choose to omit or combine with other factors. I combine power with hierarchies. Power tends to be associated with hierarchies, so theories about power also apply to hierarchies (Ardichvili et al., 2006). I also omit the culture factor (Navimipour and Charband, 2016). Some aspects of culture overlap with the language factor. However, given the scope of this thesis, I choose to omit the remaining elements of culture, because it takes too much time to collect data which would need to cover multiple cultures.

Each subchapter ends with a proposition about how the factor could relate to the transfer of knowledge during the departure of a project member, rather than just to the knowledge sharing that occurs outside of the departure process.

## 2.4.1 Ability

In my model, hierarchies, language, and competence all contribute to the first category: ability. Argote et al. (2003) do not include hierarchies in their AMO model. However, many other authors discuss how hierarchies affect knowledge sharing (Joia and Lemos, 2010; Tsai, 2002; Wang and Noe, 2010). As already mentioned in Chapter 2.3 The Ability-Motivation-Opportunity Model, common language is essential to knowledge sharing. Finally, just as Argote et al. (2003) say, the sender must have the ability to share knowledge with the receiver by establishing a common ground. Additionally, the receiver must have the ability to accept the knowledge, which is made possible mainly by competence.

Figure 3 shows the ability portion of the AMO model with the factors I discuss in this chapter.
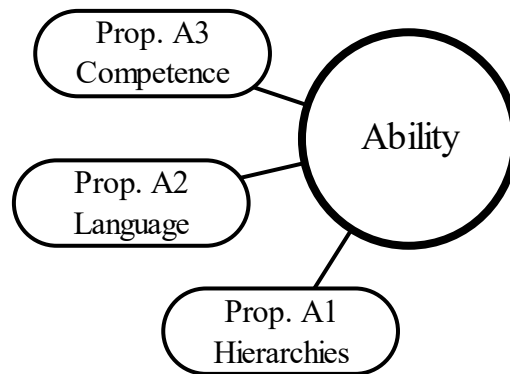


Figure 3 Ability Factors for Knowledge Sharing According to Theory

*Hierarchies*

The term hierarchy used in this thesis refers to the position of an employee within the company relative to others, not his or her level of knowledge. The latter pertains to the competence levels of both the sender and receiver, so this situation is discussed in relation to the competence factor.

Several authors have indicated that formal hierarchies within companies can have negative impacts on knowledge sharing (Joia and Lemos, 2010; Tsai, 2002; Wang and Noe, 2010). This can easily be applied to structures within projects. As an example, in the semiconductor industry, test engineers are often seen as being at a lower level than design engineers. Both roles are equally important, yet unspoken hierarchical structures may very well exist. To encourage knowledge sharing, Wang and Noe (2010) suggest that employees' position should be deemphasized. This makes sense for knowledge sharing, as it is a continuous process that may occur across many different positions.

The semiconductor industry is not immune to issues stemming from hierarchies. I, myself, have been in situations where I was reluctant to ask for help because the potential sender of knowledge was in a much higher position than I was. The sender generally had much more experience and seemed intimidating. I can imagine that in a transfer scenario, this problem may be just as prevalent as in sharing situations.

> Proposition A1: *In a transfer situation, positional hierarchy can sometimes be an issue.*

## *Language*

Since knowledge sharing requires interaction and successful interaction requires some sort of common ground, it seems clear that language can impact knowledge sharing.

From my experience, large semiconductor companies operate across many different countries, all of which speak languages other than English. Without some sort of shared language, such as English, communication would be significantly inhibited and ineffective (Cabrera and Cabrera, 2005). Additionally, a common knowledge of technical terms is of value, particularly in engineering fields (Carlile, 2004). Conveniently, most technical terms used in the semiconductor industry are in English, making communication on a technical level much easier across different countries.

> Proposition A2: *In a transfer situation, lack of a common language or technical jargon can negatively impact knowledge transfer.*

## *Competence*

Sharing knowledge can be difficult when the two parties are unbalanced in their existing knowledge and competencies. "Experts may not be as capable as beginners in understanding, anticipating, and adjusting to the level of understanding possessed by novices" (Hinds et al., 2001, p. 1234).

For knowledge transfers, although it seems reasonable to assume that the project member who will replace the departing project member will have similar technical skills, it is unlikely that the new member's former job required exactly the same skills as the new one would. In this case, it seems logical to say that competence is even more important during the transfer than during knowledge sharing. With limited time for knowledge transfer, the departing member does not have time to teach the incoming member the basics needed in order to understand the knowledge to be transferred. Even though the competency levels cannot be guaranteed to

match, at very minimum, the departing member should be aware of the incoming member's competencies, as not to waste time explaining concepts that are already known by the new member. Although awareness of competencies is rarely discussed in literature, I think it is clear that it is a major prerequisite to both knowledge sharing and knowledge transfer.

Proposition A3: *In a transfer situation, basic competencies of the sender and receiver should be matched as closely as possible.*

*Summary*

To summarize, below is a list of the three factors I propose to be in the ability category for both knowledge sharing and transfer.

- *Hierarchies*: Positions of power

- *Language*: Technical jargon and spoken and written skills

- *Competence*: Possessing the background to be able to receive knowledge

One factor that I choose not to discuss in this thesis is the ability of someone to successfully send or receive knowledge due to having prior experience in doing so. This is not something that management can really use as criteria when hiring project members, because it does not directly relate to their competence in completing tasks within the project.

## 2.4.2 Motivation

Motivation is a combination of multiple factors, many of which are of a personal nature. They include drive, trust, relationships, incentives, cooperation, and withholding. As mentioned in Chapter 2.3 The Ability-Motivation-Opportunity Model, Argote et al. (2003) place rewards and incentives into the motivation category. The authors also discuss cooperation and the tendencies of individuals to want to maintain a good professional reputation which incentivizes knowledge sharing. I add drive, trust, relationships, and the withholding of knowledge to this category, because they are often mentioned elsewhere in literature.

Figure 4 below shows the factors related to the motivation part of the AMO model.
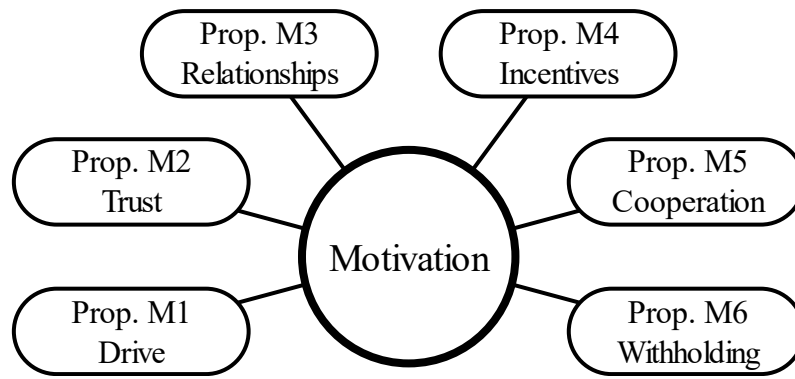
Figure 4 Motivation Factors for Knowledge Sharing According to Theory

*Drive*

Having the personal drive to share knowledge is one of the major prerequisites to knowledge sharing. Sharing is linked to one's personality. As Ipe (2003, p. 345) states, "people are not likely to share knowledge without strong personal motivation." Intrinsic and extrinsic motivation contribute to a person's drive to share knowledge (Navimipour and Charband, 2016). If someone enjoys sharing knowledge, he or she is likely to keep doing it.

I believe intrinsic motivation is paramount in the transfer of knowledge; however, this depends solely on the personality of the departing member and is not easily influenced by outside sources.

> Proposition M1: *In a transfer situation, knowledge transfer is unlikely to occur without the prerequisite of personal drive.*

*Trust*

Generally, the quality of knowledge sharing increases with trust between the sender and receiver (Khvatova and Block, 2017; Szulanski et al., 2004). Quigley et al. (2007, p. 75) state that "trust is often defined as a belief that another individual makes efforts to fulfill commitments, is honest, and does not seek to take unfair advantage of opportunities." Trust is something that functions between people and "serves as a substitute for the ability to monitor or verify information" (McNeish and Singh Mann, 2010, p. 21). Khvatova and Block (2017) discuss mutual trust, pointing out that the sender must trust the receiver to understand and use the knowledge appropriately. Likewise, the receiver must trust the sender to share information that is actually useful and relevant. In a project environment, "team members share their knowledge when they trust their partners" (Navimipour and Charband, 2016, p. 28).

Not all authors view trust as beneficial, however. While Szulanski et al. (2004) state that the trustworthiness of the source of knowledge is important, there is also evidence that suggests it

can be harmful. For instance, "a trustworthy source could distract the recipient from the actual contents of the message thus undermining the effectiveness of communication" (Szulanski et al., 2004, p. 600). This seems to indicate that trust is a double-edged sword. On the one hand, it encourages knowledge sharing. On the other hand, characteristics of trust could also inhibit the quality and effectiveness of the knowledge sharing process.

Still, I would maintain that in a transfer scenario, trust contributes positively to knowledge transfer. I would expect that if the new project member is distrustful of the departing member, the likelihood of the new member accepting knowledge and making use of it would be decreased significantly. Additionally, Khvatova and Block (2017, p. 336) state that "trust is an essential prerequisite for most forms of social interactions" and without social interaction, tacit knowledge cannot be transferred.

> Proposition M2: *In a transfer situation, trust between the sender and receiver*
> *has positive effects on knowledge transfer.*

### *Relationships*

Theory suggests that another main factor of successful knowledge sharing is having a working relationship between the sender and receiver. Argote et al. (2003, p. 575) state that "social relationships also provide individuals with the incentives to participate in the process." Cabrera and Cabrera (2005) agree that having close relationships within the workplace generally increases willingness to share. In addition to willingness to share, Chow and Chan (2008, p. 463) also state that "a good relationship will enhance knowledge-sharing behavior", potentially making it more effective.

I would expect this factor to be just as important in a transfer situation as in a sharing situation. From the sender's perspective, the departing project member would be more likely to transfer knowledge to someone he or she knows rather than to some new project member he or she has never met. Meanwhile, the receiver would be more likely to accept knowledge from someone with whom he or she is familiar and respect the validity of whatever knowledge he or she was given.

> Proposition M3: *In a transfer situation, having a relationship between the*
> *sender and receiver makes the transfer more likely to occur.*

## Incentives

Theory mentions several different types of incentives that are sometimes used to encourage knowledge sharing: monetary rewards, gift certificates, company stocks, public praise, etc. (Bartol and Srivastava, 2002; Foss et al., 2009). Unfortunately, several studies have shown that rewards do not have much of an impact on knowledge sharing. Trust and relationships are more important prerequisites to knowledge sharing (Quigley et al., 2007; Riege, 2005). Of course, that is not to say that rewards do not contribute at all; for instance, when knowledge sharing behaviors "are directly evaluated and rewarded, employees are more likely to see them as an integral part of their job responsibilities" (Cabrera and Cabrera, 2005). Providing incentives shows that the company places emphasis on knowledge sharing, which can help employees make it part of their standard routine.

Implementing a rewards system for knowledge sharing is an attempt to encourage knowledge sharing to become integrated in the company culture over time. Knowledge transfer, on the other hand, is a single event. Although I would imagine that the reward system would need to be different for such an event, it is conceivable that rewards could have an effect on knowledge transfer.

> Proposition M4: *In a transfer situation, corporate incentives, such as public recognition or monetary rewards, may encourage knowledge transfer.*

## Cooperation

Since knowledge sharing is a social process (Quigley et al., 2007), it clearly requires cooperation on the part of both the sender and the receiver. The former must be willing to share it, and the latter must be willing to accept it. As Collins and Smith (2006) put it, a proper social climate must be established, which is a combination of trust, shared language, and cooperation. This cooperation or willingness to share generally stems from good relationships and social networks (Chow and Chan, 2008).

Luckily, professionalism influences cooperation in knowledge sharing. As Argote et al. (2003, p. 575) put it, "uncooperative behavior damages individuals' reputations, so they are willing to expend extra effort transferring knowledge to protect their social standing." Similarly, "enhancing one's reputation and reciprocating others have been found to be key predictors of knowledge sharing" (Argote and Fahrenkopf, 2016, p. 151).

I believe the concept of cooperation during knowledge sharing translates directly to a transfer situation, which should be no different. Without cooperation from both parties, no interaction occurs, and knowledge transfer cannot take place.

> Proposition M5: *In a transfer situation, both parties need to be willing to interact with each other to facilitate knowledge transfer.*

*Withholding*

Being unwilling to share knowledge can be about more than just not wanting to interact with others. As discussed in Chapter 1.1 Importance of Research Question, knowledge within a company contributes to the company's competitive advantage. The same applies to the individual. A project member's knowledge may be his or her "primary source of value to the firm", so, naturally, "sharing this knowledge might potentially result in diminishing the value of the individual, creating a reluctance to engage in knowledge-sharing activities" (Ipe, 2003, p. 345).

Although Riege (2005) says that it used to be and maybe still is the case that hoarding knowledge was and is beneficial to career advancement, this makes little sense in a transferring scenario. Since the project member is leaving, it would seem that there is no real need to retain knowledge for his or her own benefit. However, he or she may withhold knowledge in order to keep a foot in the door. Keeping crucial knowledge about the project to him- or herself means that the project member's replacement will need to come to him or her for help frequently. Of course, this only make sense if the project member remains within the same company and is still accessible to the new member. In this scenario, it also provides a sort of job security within the company (Collins and Smith, 2006).

> Proposition M6: *In a transfer situation, withholding knowledge is usually only of concern if the project member remains within the company after departure.*

*Summary*

In summary, I find the following six factors most relevant to motivation:

- *Drive*: Factors that drive motivation on an intrinsic personal level
- *Trust*: Confidence about the reliability and credibility of either party
- *Relationships*: Both professional and social networks and ties
- *Incentives*: Rewards that encourage knowledge movement
- *Cooperation*: Willingness to send and receive knowledge

- *Withholding*: Unwillingness to share knowledge for personal gain

Note that relationships could actually fit both motivation and ability, according to Argote et al. (2003). Having a good relationship with someone makes the transfer easier, so one is more able to do it, but I would argue, based on personal experience, that relationships affect motivation much more than they affect ability. People generally like to help other people, and relationships create that motivation.

## 2.4.3 Opportunity

Finally, access, time, and priority all fit into the opportunity category. Both the sender and receiver must be given the opportunity to share and retrieve knowledge, respectively. Gagné (2009) mentions that people are more willing to share in environments where it is easy to do so. Argote et al. (2003) state that reducing the physical distance between the involved parties makes sharing easier. Previously, in Chapter 2.3 The Ability-Motivation-Opportunity Model, I mention that Argote et al. (2003) also say that trial-and-error learning assists in knowledge sharing. This type of learning requires time, so it seems appropriate to say that the opportunity to share knowledge involves having enough time to do so. One final factor that is not in the AMO model and is, surprisingly, rarely mentioned in literature is the priority given to sharing by both management and the parties involved in the sharing process.

Figure 5 below shows the factors related to opportunity.
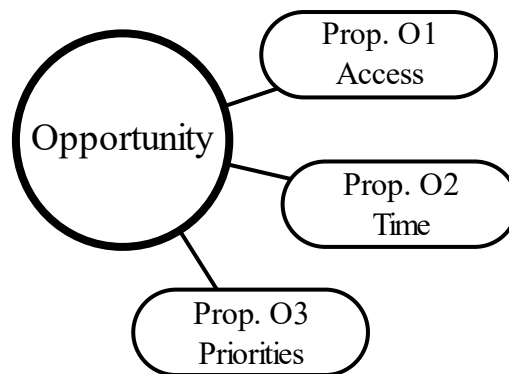


Figure 5 Opportunity Factors for Knowledge Sharing According to Theory

*Access*

Accessibility to knowledge can be determined by a variety of factors, such as time and location; I focus on the latter in this chapter, since I treat time as a separate factor. Spontaneous sharing is more likely to occur in environments where there is frequent communication and contact between parties. Obviously, when the two parties are further apart, such as being located on different continents, contact must be scheduled, which reduces spontaneity and, consequently,

also reduces frequency of knowledge sharing (Riege, 2005). Argote et al. (2003, pp. 575-576) state that "by reducing [physical and psychological] distance, organizations provide members with the opportunity to learn from each other." Here, physical distance refers to location, while psychological distance refers to trust and relationships between parties.

I would think that reducing physical distance between the sender and receiver in a transfer scenario would reduce the amount of time needed for the transfer. Face-to-face interaction would seem much more effective than phone calls, particularly when time is limited because of time zone differences.

> Proposition O1: *In a transfer situation, accessibility of the knowledge holder in terms of physical location makes the transfer more efficient.*

## Time

One factor that is often mentioned in literature is the amount of time dedicated to knowledge sharing (Bartol and Srivastava, 2002; Navimipour and Charband, 2016; Riege, 2005; Siemsen et al., 2008). Time is particularly important when knowledge is shared by having both the sender and receiver work together on a task (Bartol and Srivastava, 2002). More time spent together means more frequent communication which results in better communication (Cabrera and Cabrera, 2005).

I would see time as being particularly important during the departure of a project member since there are likely other tasks to be completed by the departing member in addition to transferring knowledge to his or her replacement.

> Proposition O2: *In a transfer situation, time dedicated to knowledge transfer is of the essence.*

## Priorities

In addition to time being an issue, setting of priorities is also of importance. Hansen et al. (1999) point out that problems can occur if priorities are not properly set. "The issue will quickly become politicized, and people will battle for resources without seeing the whole picture" (Hansen et al., 1999, p. 10). If upper management does not make clear that knowledge sharing is to be prioritized over certain other activities, employees at lower levels may not engage in knowledge sharing.

The same can be said for the transferring process. As discussed in previously, departing members have limited time after announcing the intended departure. Their time must be split

among several activities, including wrapping up tasks and transferring knowledge. I would think that setting priorities is even more critical when it comes to transfer versus sharing. During the transfer phase, there is an imminent deadline with little to no time to go back and obtain missing knowledge after the transfer period has expired. I would expect the project manager to make priorities of the departing member's tasks very clear.

> Proposition O3: *In a transfer situation, prioritization of the knowledge transfer must be given by and agreed on by management to make sure it actually occurs.*

## *Summary*

The list below is a summary of the three factors discussed for the opportunity category of the AMO model.

- *Access*: Degree of accessibility to the knowledge
- *Time*: Amount of time spent on instances of knowledge movement
- *Priorities*: Allocation of resources to knowledge movement

It is clear that providing the opportunity for knowledge transfer will make the parties involved more likely to engage in the activity. Argote et al. (2003) emphasize breaking down barriers such as distance. The authors mention both physical distance and psychological distance, where psychological distance is related to hierarchy, which is discussed in Chapter 2.4.1 Ability. While I agree that reducing psychological distance provides more opportunities for knowledge sharing, I think the ability to teach at different levels of the hierarchy is more important, especially during knowledge transfer. Thus, I find that the factor of hierarchies is more appropriately placed in the ability category of the AMO model.

## 2.4.4 Summary of Propositions

Figure 6 below shows my own representation of the original model presented by Argote et al. (2003), which includes the factors derived from theories from a variety of authors. The model shows what I believe theory implies for knowledge sharing and also what I believe may apply to knowledge transfer. Chapter 6 Discussion returns to this model and refines it based on the conclusions of Chapter 2.4.1 Analysis.
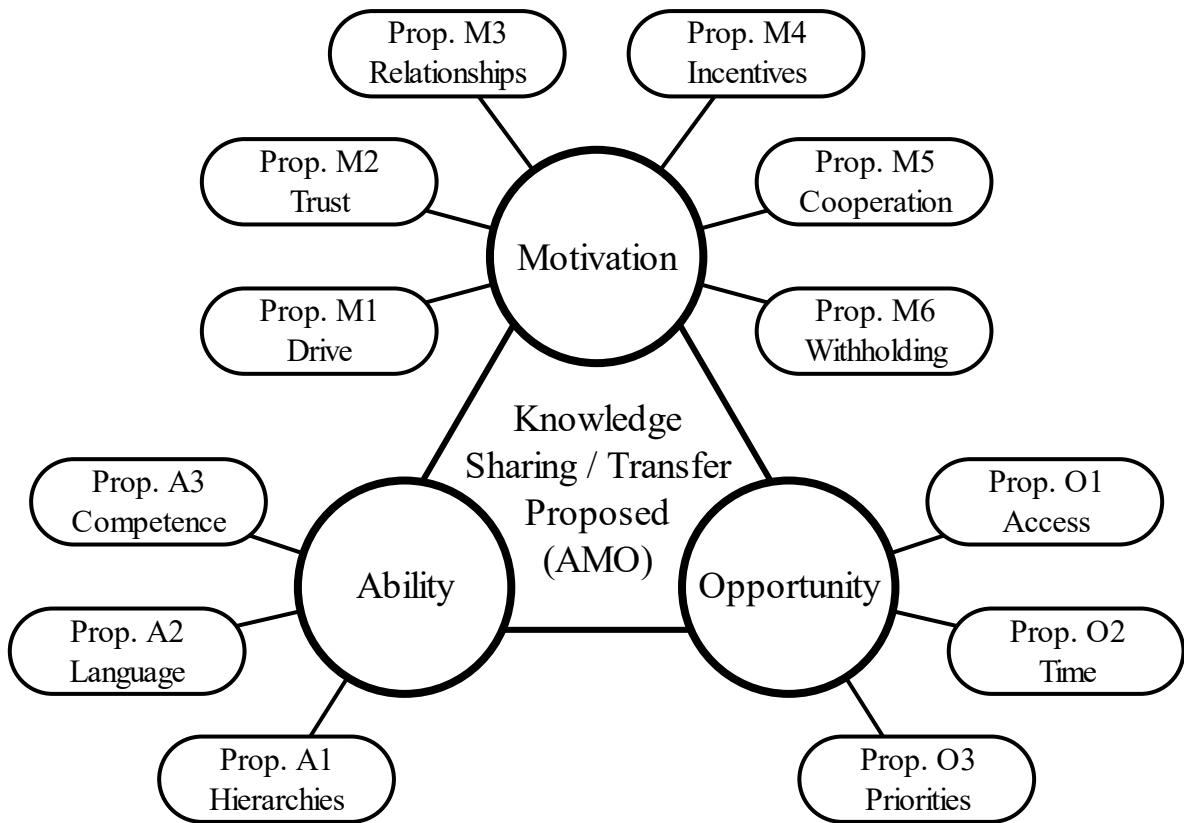
Figure 6 Modified AMO Knowledge Sharing/Transfer Model with Factors

Finally, below in Table 2 is a summary of all propositions presented in Chapter 2.4 Knowledge Movement Factors. The contents of this table are used in Chapter 5 Analysis where I use data collected for this thesis (see Chapter 4 Empirical Findings) to investigate the propositions.

Table 2 List of Propositions

| Proposition A1 | In a transfer situation, positional hierarchy can sometimes be an issue. |
|---|---|
| Proposition A2 | In a transfer situation, lack of a common language or technical jargon can negatively impact knowledge transfer. |
| Proposition A3 | In a transfer situation, basic competencies of the sender and receiver should be matched as closely as possible. |
| Proposition M1 | In a transfer situation, knowledge transfer is unlikely to occur without the prerequisite of personal drive. |
| Proposition M2 | In a transfer situation, trust between the sender and receiver has positive effects on knowledge transfer. |
| Proposition M3 | In a transfer situation, having a relationship between the sender and receiver makes the transfer more likely to occur. |
| Proposition M4 | In a transfer situation, corporate incentives, such as public recognition or monetary rewards, may encourage knowledge transfer. |
| Proposition M5 | In a transfer situation, both parties need to be willing to interact with each other to facilitate knowledge transfer. |
| Proposition M6 | In a transfer situation, withholding knowledge is usually only of concern if the project member remains within the company after departure. |
| Proposition O1 | In a transfer situation, accessibility of the knowledge holder in terms of physical location makes the transfer more efficient. |
| Proposition O2 | In a transfer situation, time dedicated to knowledge transfer is of the essence. |
| Proposition O3 | In a transfer situation, prioritization of the knowledge transfer must be given by and agreed on by management to make sure it actually occurs. |

# 3. Methodology

Since the purpose of this thesis is to attempt to apply theoretical concepts about knowledge sharing (i.e. the AMO model and relevant factors) to knowledge transfer, this research requires a qualitative design and flexible method that does not deal with numbers or statistics. The research focuses on the "what" and not the "how often" of knowledge transfer characteristics. The appropriate research design and method is chosen based on these requirements for the research and is discussed in Chapter 3.1 Research Design and Chapter 3.2 Research Method below.

Additionally, the data collection strategy is discussed in Chapter 3.3 Data Collection. The process for analyzing the data is discussed in Chapter 3.4 Analysis of Research Data. Finally, I evaluate and recap the research process in Chapter 3.5 Evaluation of Process and Chapter 3.6 Overall Process.

To guide my methodology, I use the methodology practices presented by Bryman (2012). I find this resource to be a good summary of research practices and it has everything I need to know about in order to conduct research at the small scale of this thesis.

## 3.1 Research Design

Bryman (2012) mentions five research designs: experimental, longitudinal, case study, comparative, and cross-sectional. The first design is not applicable at all to my research since it requires me to run an experiment in real time and observe the immediate results. The second also is not appropriate because this requires the study to be done over a longer period of time. The third design is also not ideal; I focus more on how knowledge is transferred in general rather than how a specific company handles transfers or a single transfer event, which would be a case study. The term case study in the subtitle of this thesis refers to the case of the semiconductor company, while the case study Bryman (2012) refers to, in my scenario, is a specific transfer event. I am not observing such a case but rather the general idea of transfer situations. Thus, a case study design does not apply. The fourth design, a comparative design, could work if I were to compare each individual case (i.e. interview) to another case within my study. Although I make some comparisons, the purpose of my research is not to compare the scenarios to each other, but rather to gather information about how knowledge is transferred across all cases. The interviews are meant to capture a summary of the various situations.

Given the arguments against all other designs, the "cross-sectional" approach is the best match for my problem statement. "A cross-sectional design entails the collection of data on more than one case" (Bryman, 2012, p. 58), which is exactly what I do. I interview multiple current and former project members who either left a position within a project or joined a project. Each case is unique and involves different companies, all within the semiconductor industry. Bryman (2012) also states that the data is collected at a single point in time. Although I interview subjects about incidents that occur at different points in time, all interviews are conducted within days of each other (i.e. a single point in time).

## 3.2 Research Method

Of the three main research methods that Bryman (2012) discusses, qualitative research is the most suitable method for my problem statement. Reasons for not choosing one of the other two, quantitative and mixed methods, is discussed before I present the research method I choose for my research.

Bryman (2012) states that quantitative research deals mainly with numerical data or any other data that can be quantified. In the case of my research question, I do not collect countable data but rather explore the experiences of the interviewees to determine which characteristics of knowledge transfer affect the transfer the most. Thus, quantitative research is inappropriate for my research question. Mixed methods research is "research that combines quantitative and qualitative research" (Bryman, 2012, p. 628). Again, since I do not collect quantifiable data, this approach does not apply.

Meanwhile, "qualitative research is a research strategy that usually emphasizes words rather than quantification in the collection and analysis of data" (Bryman, 2012, p. 380). This description fits my research much better. I use a semi-structured interview guide and am open during the interviews to exploring areas I did not anticipate covering. I have a general idea of the kinds of answers I would get, but since everyone's experience is different, some things may emerge that I might not cover in my interview questions.

I believe the most important benefit of choosing a qualitative approach is that it allows for more exploration. Other than recognizing which factors are brought up more often by the interviewees, there is no other quantitative data to analyze.

## 3.3 Data Collection

All data collected for this thesis was through interviews with former coworkers of mine at a global semiconductor company. All interviewees were very willing to participate since I had already interacted with them previously in a positive manner. This made it much easier to coordinate with them. I also believe I received more in-depth answers than I would have received had I not known them from before. There may, however, have also been some disadvantages to being well-acquainted with the interviewees. I discuss these potential issues at the end of this thesis in Chapter 0

Limitations. In Chapter 3.3.1 Selection Process, Chapter 3.3.2 Preparation, Chapter 3.3.3 Interview Process, and Chapter 3.3.4 Transcriptions, I discuss how I set up and conducted the interviews.

### 3.3.1 Selection Process

To obtain interviewees, I used connections I had to my former coworkers at a global semiconductor company. I sent out inquiries as to their availability and willingness to participate about two months prior to conducting the interviews. Of the eleven people I selected, eight were available to be interviewed. Bryman (2012) says that sample sizes should be significantly higher than this; however, this thesis was conducted with limited resources, so a larger number of interviews would have made this thesis impossible to complete within the given time frame.

When I first sent out the inquiries, I also included a note saying that if they knew anyone else who might be interested in being interviewed, they should let me know. Unfortunately, my attempt at using snowball sampling failed (Bryman, 2012). Although I tried to stick to purposive sampling, my sampling more resembled convenience sampling (Bryman, 2012). In Chapter 0

Limitations I explain why I had to settle on this type of sampling.

All of them fit the criteria of having had worked in a field that required special technical skills or expertise (i.e. not in purely managerial positions) and having had at least two experiences to discuss (i.e. one moving into a project and one moving out of a project). All of them were available for an interview for up to one hour.

Seven of the eight interviews were conducted in person. I visited the company campus three times, conducting first one interview, then five interviews, and then another single interview.

The eighth interview had to be done via video conference, as the interviewee worked at a location too far away for me to reach in person.

*Relationships*

All eight interviewees had worked with me directly previously. Hierarchically, we were all on the same level (i.e. I did not work for any of them and none of them worked for me). I had good professional and personal relationships with them and they were all very motivated to take part in the interviews. I felt that they were all very honest with me in their interviews as many of them did not hold back when discussing negative aspects of knowledge transfer that occurred between them and other former coworkers of mine.

Unfortunately, several interviewees tended to go off topic often during the interviews, because they would go on tangents about the current status of projects we had worked on together. This would probably not have happened so often if I had not had relationships with the interviewees.

*Backgrounds*

While all interviewees worked in the semiconductor industry, their roles varied. Personal experience has shown me that transferring knowledge related to software, hardware, and documentation can be somewhat different. Additionally, different roles have different levels of importance in projects which can also affect the way knowledge is transferred. Hence, with the intention of sampling a more well-rounded pool of data and gaining insight from various perspectives, I chose people with a variety of backgrounds, some having experience in several fields. These fields included software, hardware design, applications, technician work, and documentation. Some interviewees were involved in multiple fields; their feedback was particularly important, because it illustrated that some knowledge transfer factors are sometimes more important in certain fields than in others.

Table 3 below consolidates all information about the interviewees, including a pseudonym for the purposes of attributing specific data and quotes, main job functions related to the cases discussed, and the duration of the interviews. They are listed in the order in which they were conducted. Pseudonyms were assigned after all the interviews were completed and I alone retain the original audio and transcripts of each interview and the corresponding name of each interviewee.

Table 3 Interviewee Information

| Pseudonym | Software engineer | Hardware design engineer | Application engineer | Hardware technician | Technical documentation lead | Duration of interview (minutes) |
|---|---|---|---|---|---|---|
| Jim | X | | | | | 57 |
| Stanley | | X | | | | 46 |
| Oscar | | X | X | | | 36 |
| Dwight | | | X | X | | 33 |
| Toby | | | X | | | 39 |
| Ryan | | X | X | | | 37 |
| Phyllis | | | | X | X | 47 |
| Michael | X | | X | | | 53 |

While Table 3 shows the job function or functions of each interviewee, I do not reference these labels in my thesis. This table merely demonstrates the diversity of job functions in my sample lot.

Some interviews were shorter than others and I did not get the same amount of data out of each of them. The duration of the interview is not directly proportional to the amount of data obtained, however. For instance, while Michael's interview was fairly long, I was able to get more data out of the interview with Ryan, which was significantly shorter. This was because my interview style was to let the interviewee talk about the transfer process freely without me interrupting the thought process. Michael tended to repeat himself while Ryan was straight to the point. Dwight's interview was the shortest, mainly because he had not moved from one project to another as often as the others had.

### 3.3.2 Preparation

About a month before the start of the interviews, I assembled a semi-structured interview guide. I used previous research into theory as well as my own experience with knowledge transfer to help determine which questions were relevant and most important. The interview questions are shown in the Appendix.

The first interview (Jim) was a sort of practice interview. After finishing that interview, I made notes about which topics did not need to be discussed in so much detail. Looking back at the data I collected through each interview, I do not believe that I missed out on any important

information in the earlier interviews. Had I required clarification, I could have easily contacted the interviewees to obtain the needed answers. However, this was not necessary, so data was collected from each interviewee only once.

The interviewees were not told in advance what questions I would ask, since I wanted to let them speak freely about their transfer experiences without putting words in their mouths or steering them in a certain direction. This helped me stay as unbiased as possible. Unfortunately, this also meant that the interviewees were potentially not well prepared for the interview. There may have been incidents or other feedback they failed to mention, because they only had a limited amount of time to consider the questions. However, I believe the pros of not distributing the questions in advance outweighed the cons.

### 3.3.3 Interview Process

I began each interview with a short explanation of my thesis topic as well as the difference between information and knowledge. I then asked the interviewee to describe a transfer scenario. Most of my questions were generally answered without me having to ask them. As Bryman (2012, p. 470) said, "in qualitative interviewing, 'rambling' or going off at tangents are often encouraged – it gives insight into what the interviewee sees as relevant and important". This was particularly helpful in cases where the interviewee brought issues to my attention that I had not previously considered.

When the interviewee had finished, I would ask the questions that had not been answered yet. I repeated this process at least once more, so I could collect data about both a sender and receiver scenario from each interviewee. Time-permitting, I asked the interviewee to recount additional transfer situations.

### 3.3.4 Transcriptions

After I conducted the interviews, I transcribed each of them. While much of each interview was transcribed verbatim, there were some exceptions and additions.

As I mentioned in Chapter 3.3.1 Selection Process, the length of the interview did not necessarily reflect the amount of data obtained through each interview. Bryman (2012) states that "not very useful" sections of an interview should be transcribed anyway, because one may find useful information in it later. However, in my case, parts of the interviews were completely irrelevant, so I disregarded this rule of thumb and did not transcribe them. For instance, one interviewee spent several minutes talking about the details of a project I had worked on with

him. These details included specifics about changes he had made to code I had written. None of this was in any way relevant to my research. I did, however, make notes about these topics in my transcriptions and also noted the timestamp of when these discussions occurred, so I could easily find them later if necessary.

In addition to the transcriptions, I made notes about the implications of what was being said or body language that was not expressed in words (e.g. nodding instead of an audible "yes"). Many of the examples discussed in the interviews involved personal relationships between the two parties involved in the knowledge transfer. These relationships were important to understand but were not discussed in detail, since I already possessed this background information from having worked with everyone involved, consequently, saving time. This also put me in the unique position of being able to fill in the blanks and understand more deeply what the interviewees were trying to express. This gave me the opportunity to actually collect more data than what was transcribed, since I was able to analyze the conversation and extract more unspoken data. However, as is discussed in Chapter 3.5.1 Reproducibility, this can also be seen as a negative attribute of the situation.

## 3.4 Analysis of Research Data

Due to time restraints, I was only able to go through one official round of data collection. However, as I describe in Chapter 3.6 Overall Process, I conducted the interviews prior to knowing exactly which factors I would be investigating. That allowed me to essentially perform a second round of data collected during my interviews. As I listened to the interviewee describe his or her knowledge transfer experience, I quickly analyzed the data I was collecting and asked further questions based on specific characteristics of the transfer that the interviewee described. Basically, I was reshaping my theory while I was conducting the interview.

Following the interviews, I conducted more thorough analysis of my data using grounded theory. Bryman (2012) discusses grounded theory as a popular framework for analyzing qualitative data such as the interviews I conducted in my research. Elements of this approach to analyzing data include coding, theoretical saturation, and constant comparison.

### *Coding*

After I transcribed all the interviews, I performed basic coding on each transcript. While Bryman (2012) suggests that one labels sections of the transcript with the topics they cover, I found it easier to organize the data into categories using a spreadsheet. I listed each knowledge transfer factor I was investigating as well as some additional categories on the y-axis and each

interviewee on the x-axis. I then sorted the contents of each interview into these categories using both paraphrases and direct quotes. To write Chapter 4 Empirical Findings, I selected the most important data from the interviews to convey a summary of the findings for each category.

Chapter 4 Empirical Findings does not follow the AMO structure. Rather, it simply groups factors together that were similar. I originally had each original factor separate, but as I analyzed the data in the transcripts, it made more sense to group them, because some answers I received applied to multiple knowledge transfer characteristics. This is described in more detail in Chapter 4 Empirical Findings. Chapter 5 Analysis follows the AMO model again.

Figure 7 below shows the four main categories I used as well as the subcategories that I later transformed and combined to form a more comprehensible presentation of the findings in Chapter 4 Empirical Findings. The three categories of process, knowledge, and miscellaneous provided background information and context while the factors category encapsulated the data relevant to the factors, which I used in Chapter 5 Analysis to evaluate the propositions from Chapter 2 Theoretical Foundation.

**Research Question**

How do the factors of the AMO model for knowledge sharing apply to knowledge transfer during the departure of a project member in the semiconductor industry?

**Process**
- Sharing beforehand
- Using knowledge after departure
- Contact after departure
- Transfer training
- Learning during transfer

**Knowledge**
- Type of knowledge transferred
- Mediums used during transfer

**Miscellaneous**
- Most important issues
- Other comments

**Factors**
- Relationships
- Hierarchy
- Understanding
- Reasons for motivation
- Cooperation
- Incentives
- Withholding
- Time
- Trust
- Language
- Learning styles

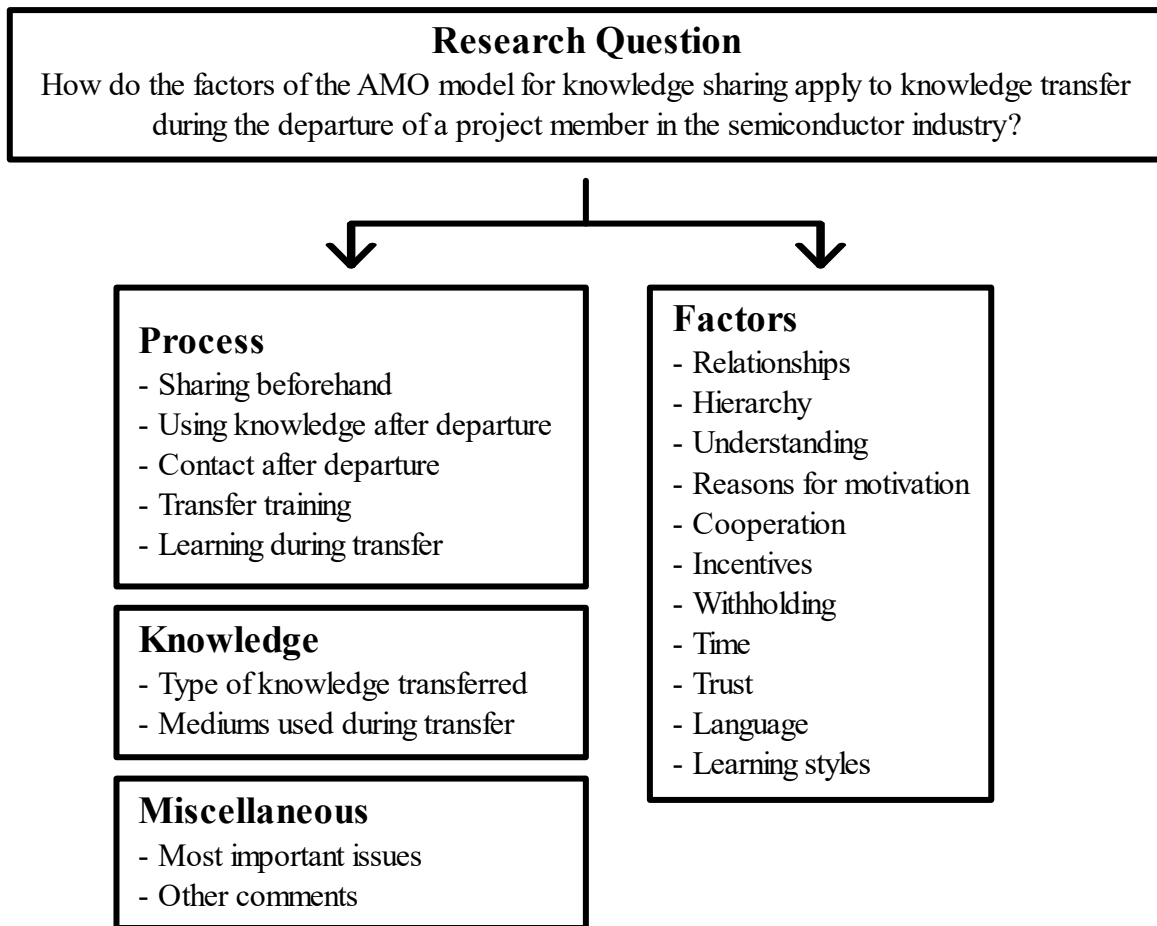Figure 7 Coding Structure of Empirical Findings

After coding the data according to these categories, I preliminarily analyzed the data and grouped similar topics into the categories shown on the left side of Figure 8. During my final analysis of the data in Chapter 5 Analysis, I selected twelve factors (see right side of Figure 8) that were addressed in my interviews and use those in the AMO model.

| Data Factors | Final Factors |
|---|---|
| - Trust and Relationships<br>- Hierarchies<br>- Incentives, Motivation, and Cooperation<br>- Language and Understanding<br>- Personal Competitive Advantage<br>- Time and Priorities<br>- Teaching and Learning Styles | - Hierarchies<br>- Language<br>- Competence<br>- Drive<br>- Trust<br>- Relationships<br>- Incentives<br>- Cooperation<br>- Withholding<br>- Access<br>- Time<br>- Priorities |
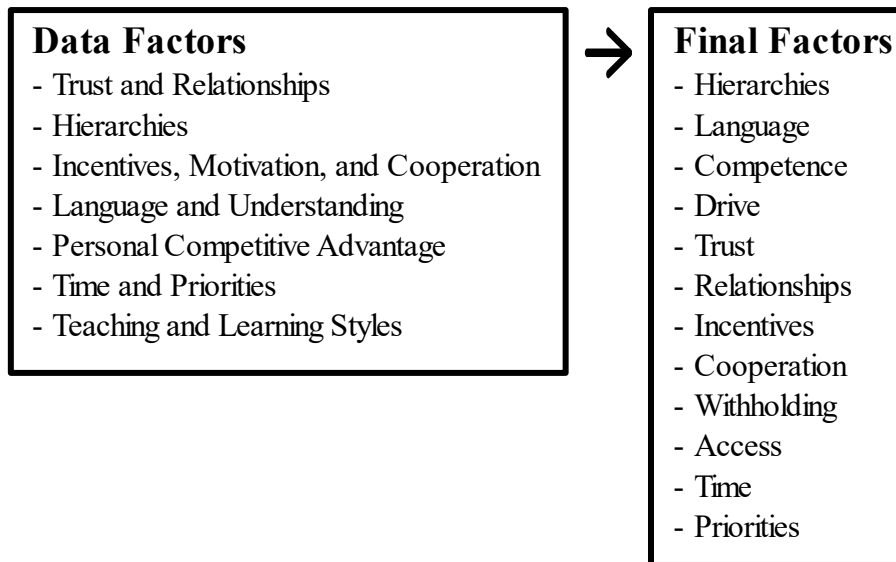
Figure 8 Analysis of Factor Data and Resulting Factors

*Theoretical saturation*

Bryman (2012) states that theoretical saturation is achieved by collecting further data after the initial categories have been established in order to uncover more data that may shed further light on the categories. This is not always necessary, and in my case, I was relatively satisfied with the amount of data collected on each topic. With more time, it may have been beneficial to expand on some factors, but for the scope of this thesis, one round of interviews was sufficient.

*Constant comparison*

The final element Bryman (2012) mentions is constant comparison, which boils down to a method of making notes about the data to assist with coding. My process for this was to highlight important sections of the transcripts, make notes directly in the document, and then fill in the column described above with paraphrases and notes about the topic.

## 3.5 Evaluation of Process

Bryman (2012) presents multiple ways in which research can be shown to be relevant, reliable, trustworthy, replicable, etc. Two main topics appear to be most applicable to qualitative research, which is the kind of research I conducted in relation to this thesis. These are applied to my research in Chapter 3.5.1 Reproducibility and Chapter 3.5.2 Trustworthiness below.

### 3.5.1 Reproducibility

Bryman (2012) states that reproducibility of research is important. Although it is mainly used in quantitative research, it may also be useful in qualitative research, such as in my thesis. This

may be difficult to achieve in my case. As I already discussed in Chapter 3.3.1 Selection Process, I believe my relationships with the interviewees allowed me to obtain very honest answers. Other researchers who do not have connections to their interviewees may be given answers that only reflect the "good" in people's actions. Also, unless the researcher has knowledge about the industry he or she is investigating, he or she may not be able to fill in the blanks and interpret answers in unspoken context like I did. Finally, the researcher may use a sample that exhibits different personalities, which has a main effect on knowledge transfer. Thus, the data collected will likely be different.

## 3.5.2 Trustworthiness

Bryman (2012) describes trustworthiness of research with four criteria: credibility, transferability, dependability, and confirmability. In this chapter, I apply these criteria to my research to demonstrate its trustworthiness.

Credibility of research means that the methods used in the research were appropriate and the findings were properly documented (Bryman, 2012). I believe I have done both; I have presented the methods I used which I found most appropriate to obtain my data and I documented it in a way that reflected what the interviewees conveyed.

Transferability of research is demonstrated by how well it can be applied to another context, if at all (Bryman, 2012). Since my data came from the semiconductor industry, my research was very specific to this field. While the outcome may not be the same, the same theory and research method should be applicable to other fields. Comparing the outcome of this research to research in a different field may result in a modified or refined version of my theoretical model.

Dependability of research refers to how well the research process was documented and followed (Bryman, 2012). I kept a log of my tasks and documented my method in Chapter 3 Methodology. Bryman (2012) suggests that an audit by a third party may be in order, but given the small scale of this thesis, I find that such an audit is unnecessary.

Finally, confirmability of research means that the author was minimally swayed by personal bias, preferably free from bias all together. I was very aware of my personal bias at the start of my research and made every effort to eliminate it throughout the process of writing this thesis. An example of bias would be presenting the interviewees in a better light than how they presented themselves by intentionally omitting data that might incriminate them. However, it turned out that this data was not needed anyway, so being biased in this way was not an issue.

## 3.6 Overall Process

The development of this thesis spanned over a period of five months. I started with some preliminary research into knowledge sharing theories to build on a literature review I conducted previously on a similar subject. Here, I identified the main factors of knowledge sharing that I wanted to investigate to see if they apply to a knowledge transfer situation. At that point, I had neither explored the AMO model nor categorized the factors in any way. Although unintended, this turned out to be a useful strategy, because I was not tempted to manipulate my interview questions to match any agenda I may have had. I simply investigated which factors were important, irrelevant, or missing from my original list.

Shortly after this initial research into theory, I completed the interviews. I had to collect my data early on in the process due to the limited availability of the interviewees. I preferred to conduct the interviews early in person rather than late using a video conference. Although I did not have an absolutely clear direction at the time, collecting data so early turned out to be advantageous. Categorizing the data by factors helped me understand the theory I had already compiled. Additionally, I discovered that some factors should be combined while others should be split into separate factors. This is the main reason why the order of the presentation of my data and grouping of factors in Chapter 4 Empirical Findings does not exactly match the factors discussed in my propositions in Chapter 2 Theoretical Foundation.

After collecting the data, I returned to the theoretical portion of the thesis and created propositions involving all twelve factors I chose to examine. The propositions reflect knowledge sharing theories and my own opinion about how the factors might apply to knowledge transfer prior to collecting data.

As already described in Chapter 1.2 Thesis Structure, the remaining chapters, Chapter 5 Analysis, Chapter 6 Discussion, and Chapter 7 Conclusion, result from the analysis of theory and data.

## 3.7 Personal Reflections

Although I tried to remain as unbiased as possible throughout the duration of this thesis, the selection of interviewees was a bit risky. I have no doubt that the interviewees answered honestly, but I probably would have gotten somewhat different results had I interviewed former coworkers with whom I did not have close relationships. These other former coworkers had different personalities that could easily affect how they transfer knowledge and what drives

them to do so. Thus, I would conclude that my data, while not invalid, shows only a limited view of the situation.

I believe that my prior experience working in the semiconductor industry gave me a major advantage when it came to asking the right questions in the interviews and interpreting the data within its context. I also found that having both a previously established professional and personal relationship with the interviewees was more beneficial than detrimental, despite the issues mentioned in Chapter 0

Limitations. This is in line with what Bryman (2012) says about the importance of learning the native language. I was already familiar with the field and language associated with it.

Most importantly, however, I have a personal interest in the topic of this thesis, having witnessed many transfers or rather lack of transfers myself. As an engineer, I tend to find problems and then attempt to fix them. I used the same approach in this thesis: investigate how knowledge transfer can be made more successful and provide a framework for others to use to achieve optimal knowledge transfer.

# 4. Empirical Findings

In Chapter 4 Empirical Findings, I present the data I have collected through the interviews. Chapter 4.1 Transfer Process and its subchapters present data about the transfer process in chronological order. Following that, Chapter 4.2 Influential Factors details the answers given by the interviewees regarding the many influential factors of knowledge transfer as presented in existing theory as well as additional factors uncovered during data collection.

## 4.1 Transfer Process

The subchapters of Chapter 4.1 Transfer Process present the data relating to certain aspects of the transfer process, such as training, timing, type of knowledge, knowledge creation, mediums, use of knowledge after transfer, and contact with the departed member after the transfer.

### 4.1.1 Transfer Training

All interviewees agree that there is no such thing as knowledge transfer training provided by the company or management. Some say they learn by watching others. Some say they simply become more experienced over time. Most indicate that it is a matter of personality, rather than formal training.

More weight seems to be on the receiver, however. Not everyone is a good teacher, so it is best to rely on the ability of the receiver to find a way to retrieve the knowledge from the departing project member. That, however, requires skill and relates to many of the factors presented in Chapter 4.2 Influential Factors.

### 4.1.2 Timing of Transfer

Something interesting that emerges from the interviews that I did not consider in the interview questions is the scenario where the project member departs before a new project member joins.

Everyone agrees that the optimal situation is where the new member arrives before the departing member leaves, but, more often than not, a new project member is not hired before the departure of the former member. The interviewees mention several situations in which they were unable to transfer knowledge to their successor due to the lack of a successor. This happened mostly in cases where there were lay-offs or the departure was too sudden for any preparation in personnel change to be made.

Generally, if the departing member has already left, the new member is just handed a hard drive that contains only information. The only way to have this information be accompanied by knowledge is to have some other project member temporarily be the owner of this knowledge until the new member joins. In this case, other project members are used as temporary storage of knowledge. Unfortunately, in most cases, these other project members are not experts in the position of the departing member.

*"If they bring somebody in [after the departure], they are going to get thrown in the pit. Baptism by fire." (Jim)*

Oscar says that over the years, he has acted as temporary storage, where it also became permanent in some cases (i.e. he eventually became the new project member). Although he generally does not volunteer for this role of the keeper of knowledge, his personality attracts this role. Management recognizes that he is interested in being challenged and has a broad enough background to be able to understand the knowledge coming from all these different projects. He is also reliable and easy to work with.

Another case discussed in the interviews is Michael's interaction with departing members that were not part of his project. Michael went as far as going to a departing member of another group to gain his or her knowledge in order to pass it on to the new member. His personality drives him to want to help the company as a whole by helping bridge the gap between departure and arrival, even though it is not even his own team.

The general consensus seems to be that in the event of a gap in sufficient staffing, the departing member looks for someone who is reliable (see Chapter 4.2.1 Trust and Relationships). The background knowledge or involvement of the temporary knowledge storing member is secondary to reliability and cooperation. Sometimes the most important type of knowledge transferred does not necessarily require a technical background.

## 4.1.3 Sharing Outside of Transfer Process

In addition to transferring knowledge during the transfer phase of a project member's departure, there is also much sharing of knowledge going on prior to a project member leaving.

Sharing knowledge seemed to be important to many of the interviewees. Reasons for this include fostering mutual growth by working together and sharing what one does if one believes it is relevant or helpful for others. Meanwhile, there can also be ulterior motives such sharing knowledge so others do not come back asking for help in the future. As application engineers,

both Oscar and Ryan say that they share knowledge because it is part of their job. They must interact with field application engineers and customers and share knowledge with them. Additionally, they share with other project members, so everyone is at least aware of what others are doing. Toby said it is good practice to at least be aware of what others are doing. People also need to consider what happens if they are incapacitated in any way that would affect the progress of the project. Sharing knowledge frequently helps create a sort of redundancy that ensures that the project will continue running smoothly while a key player is out.

> *"You do not want to have one guy doing everything, because if he is leaving,*
> *you are dead." (Ryan)*

## 4.1.4 Types of Knowledge

Everyone agrees that knowing where things are is the most important and most transferred type of knowledge. In fact, knowledge of locations is the only thing transferred if there is no time for anything else (see Chapter 4.2.6 Time and Priorities). These things include digital information such as emails and datasheets as well as physical objects such as prototype ICs and test equipment.

> *"… at least he knew where [the information] was…" (Jim)*

The second most important knowledge is the knowledge of who is involved in the various aspects of the project. The reasons for the importance of this type of knowledge is that not all knowledge about the project can be transferred by the departing member. Once that member is gone, the source of knowledge must change. In that case, everyone else involved in the project as well as outsiders that have specific skills will need to be called upon.

One type of knowledge that must be transferred but really cannot be transferred relates to this second knowledge type: relationships. The rest of the team and other contacts do not want to rebuild relationships if they can help it. This transfer of relationship knowledge seems to be most important in the application engineer position within a project, since application engineers must interact frequently with colleagues, such as field application engineers in other parts of the company and, most importantly, with customers. To add to that, Ryan, an application engineer, also says that the toughest part is transferring the business by transferring the customer, rather than transferring knowledge about information.

Having knowledge of existing relationships is critical when trying to implement better processes after the departure is complete. The departing member may have close allies within the project who may react negatively towards ideas presented by the new member due to their loyalty to the departed member. Unfortunately, knowledge of relationships is only transferred on the rarest of occasions.

## 4.1.5 Creating Knowledge During Transfer

The consensus is that new knowledge is generally not created during transfer. The focus of the transfer is making sure the receiver understands the knowledge. Improving processes is something that occurs after the transfer is complete or the departing member has already left.

*"At the beginning, you absorb information." (Ryan)*

However, the interviews reveal two instances in which some learning occurred. In the case of software, coming in as an expert in software into a position that is being vacated by a non-expert, working with the departing member produces new knowledge because of the introduction of newer software concepts and processes. Jim makes clear, however, that this probably would not happen if the departing member spends less time transferring knowledge and is less interested in the future success of the project.

Another instance of knowledge creation is in the case of Phyllis. While transferring knowledge, she increases her knowledge regarding how to transfer knowledge. Thus, she is not necessarily creating knowledge about what she was transferring but rather how she is transferring it.

## 4.1.6 Mediums Used During Transfer

Knowledge comes in all forms. It can be transferred via documents, one-on-one interactions, training sessions, emails, phone calls, and, though anecdotally, even paper airplanes. What medium is used depends on the proximity of the sender to the receiver, whether the sender and receiver are even in direct contact (i.e. if the new member is already there before the departing member leaves), and what is most effective for the type of knowledge being conveyed.

Proximity of the sender to the receiver allows for more direct forms of knowledge transfer. Sitting close to someone means the meetings used for transferring knowledge are more impromptu and more efficient. The receiver does research on his or her own and then goes to the sender if he or she has further questions. Sitting near the sender is very convenient, since the receiver can ask questions as they arise and does not need to wait to schedule a phone call.

Another technique is having daily appointments scheduled to learn about specific processes required in the new position. These are in-person and sometimes conducted in a lab where tests are performed.

Ryan recounts a case in which he did not find himself in such a convenient situation when taking over someone's role who was located in another country. In his case, he had to make phone calls two to three times a week and only during specific times due to the time zone offset. Phone calls and emails were the main communication tools. The departing member did make a trip to Ryan's place of work to make the transfer easier, but his time was restricted to just two weeks.

Some positions require most of the business to be conducted over the phone. Phyllis, who was in such a position, recalls that much of her knowledge was conveyed to her by an eavesdropping cubicle neighbor who would send knowledge about products or processes via instant messages and sometimes paper airplanes. As an example of how critical proximity is, Phyllis says her work environment changed after many years of being able to share knowledge in this manner. The new environment requires phone calls to be conducted in conference rooms rather than in cubicles. She says that this has a severely negative effect on real-time knowledge sharing and significantly reduces the speed at which she can do her job.

> *"We are so close to each other I can be talking on the phone and asking one thing and [my coworker will] write a report and send me the answer before I am off the phone call. [...] now that sharing has kind of stopped." (Phyllis)*

As stated in Chapter 4.1.2 Timing of Transfer, direct contact between the sender and the receiver may not always be possible due to the lack of overlap of employment. In this case, either the sender must have documented at least some of his or her knowledge, or the receiver must attempt to gather knowledge from remaining project members. The latter obviously requires one-on-one interactions.

Knowledge transfer mediums are not evenly distributed across all disciplines. What works for software positions does not necessarily work for application engineering jobs or hardware design roles. Much of the knowledge required for software-heavy positions relates to code. Although it is standard practice to comment code as one is writing it, there are many issues with this: few people do it, the code is not easily understood even with comments, and some coding languages do not allow commenting. Code can also become very complex and is usually written in a style that is easy for the coder to understand but not necessarily easy for an inheritor

of the code to comprehend. Thus, the transfer of code must be accompanied by transfer of knowledge about the code. This is usually done in one-on-one interactions. It is very difficult to write a document describing how the code works; it is much easier to demonstrate the code in action and then discuss its functions.

For application engineering roles, knowledge about how the product functions and knowledge about relationships, as discussed in Chapter 4.1.4 Types of Knowledge, are most important. The former can be gleaned from datasheets, which contain mostly information, and also from user guides about how to use the product, which is mostly knowledge. The latter type of knowledge about relationships is usually documented through emails. However, going through hundreds of emails in order to understand what the relationship between the previous application engineer and their customers was like is nearly impossible. Thus, again, one-on-one time is needed so the sender can explain the current situation to the receiver. Generally, all the open customer requests must be addressed first. Knowledge about these requests must come directly from the departing member, as he or she is the one that is on top of the situation.

For both applications and hardware design, much knowledge comes in the form of presentations and hands-on training. Training sessions generally begin with a broad presentation on the subject, followed by hands-on training in a lab, if applicable. The receiver is usually told to work through a problem while the sender supervises. This way, mistakes that the receiver will probably make in the future are caught early. To summarize, personal interaction is critical and absolutely necessary when transferring knowledge.

> *"Some stuff you can tell someone until they're blue in the face, [but] until they*
> *actually do it [they won't internalize it]." (Toby)*

## 4.1.7 Use of Knowledge After Transfer

There are four situations mentioned that involve the use or non-use of knowledge after a transfer. The first is not using the knowledge after the transfer because it is no longer needed. This happens mainly in cases where the departing project member joins another project but in a different role. As an example, Toby worked mainly with digital systems before moving into a solely analog systems role. Much of the knowledge he had acquired about digital systems was no longer of any use, so most of what he transferred to the new project member was no longer used by him in his new position.

The second situation is the opposite of the first: using the knowledge because it is still relevant in the new position. This applies mostly to cases where the role of the departing project member

in the new project is similar to his or ger role in the previous project. Oscar's situation is the perfect example of this; he is involved in so many similar projects that he just keeps using the same knowledge over and over again in each of his roles.

The third situation is continuing to use it for the sole purpose of continued support of the old project. Such is the case in Dwight's situation where he transferred knowledge about testing procedures to his successor before moving into a technician position. The receiver had many issues after the official transfer ended, so Dwight had to frequently use his knowledge to complete certain small tasks to help out.

The fourth situation is related to proprietary knowledge and applied only to cases where the departing project member leaves a project that involves confidential information or leaves the company entirely. While, ideally, the company would expect the departing member to forget and never use this proprietary knowledge, small parts of the knowledge are sometimes used by departing members in their new projects or positions. Additionally, non-disclosure agreements on this kind of knowledge usually have an expiration date, so it is perfectly legal for departing members to hold on to the knowledge and then use it once it becomes public domain. The rule of thumb is that one should keep as much knowledge as one can, since one may need it someday.

*"Does any knowledge really ever go away once you have absorbed it?"*

*(Phyllis)*

## 4.1.8 Contact After Transfer

All interviewees agree that contact may occur after the transfer. However, whether or not it happens, how long after the departure it occurs, or how often it takes place depends on the manner of departure, the new location of the departed member, and what the relationship between sender and receiver is like.

When the project member leaves the company entirely, particularly in lay-off situations where the project member does not leave of his or her own accord, contact occurs only very rarely, if at all. Here the relationship between sender and receiver matters (see Chapter 4.2.1 Trust and Relationships).

When the departing project member stays within the same company, he or she is more accessible, so the contact can range from several months to several years even. Contact usually decreases as time goes on as the receiver becomes more knowledgeable and able to work

independently. However, there are some cases where contact does not decrease. This is mainly due to the sender purposely withholding knowledge (see Chapter 4.2.5 Personal Competitive Advantage).

Both Ryan and Oscar, who are both hardware design and application engineers, say that there are some types of knowledge that are too difficult to transfer, and it makes more sense for the departing member to retain the related responsibilities. For instance, application engineers frequently develop spreadsheets for calculating values which customers require. These spreadsheets are usually customer-specific and created based on immediate need. They can become very complex and are usually not well-documented. Thus, it is much easier for the old application engineer to modify the spreadsheet as requested by the new application engineer. Likewise, hardware design engineers sometimes perform tests using small bits of code. Some languages do not allow for comments, so once again, the information is not well documented and the knowledge about the code is not transferred to the new member. In this case, it is again easier for the sender to make small changes when necessary than to try to train the new member on every little detail of the code. Similarly, in a problem-solving environment, it is impossible to write down and impart knowledge about all the things that could go wrong and all their solutions. This is something the new project member would need to figure out on his or her own or come back to the departed member for help.

Surprisingly, there are also instances where the sender withholds knowledge because he or she wants to keep one foot in the project or his or her previous role (see Chapter 4.2.5 Personal Competitive Advantage). Based on the data collected in the interviews, this behavior appears to span all jobs, including technical documentation publishers.

Others willingly offer their services after moving on to a new position, simply because they enjoy being part of the project. Such was the case in Michael's situation, where he offered his help going forward after leaving a project but staying within the company and then also after leaving the company entirely. In his situation, he even went back to working on his old project for a while after having already moved to a new project because his expertise was needed. However, after leaving the company entirely, he was no longer contacted. Apparently, this is company policy; former employees are not to be contacted. However, just as stated previously, this rule can be bent when good relationships have been established (see Chapter 4.2.1 Trust and Relationships).

## 4.2 Influential Factors

The interview questions reflect the factors related to knowledge transfer found in theory. However, during the interviews, additional factors emerged. In the subchapters of Chapter 4.2 Influential Factors, my findings about all factors, theoretical and new, are presented.

### 4.2.1 Trust and Relationships

Data collected about trust and relationships was obtained through two separate questions. However, the answers received for these questions were all very similar, indicating that these two factors are closely related. Thus, they are grouped together in this chapter.

In the event of not having an immediate successor to whom to transfer knowledge, most interviewees say they find someone they trust or with whom they have a good relationship. This is particularly important in cases where there is limited time available for the transfer.

As an example, in one of Jim's cases, he was laid off and had only one day to transfer his knowledge. He decided to pick someone he knew and trusted who was not working on his project rather than someone within the project whom he did not know very well. He feels that the knowledge is better kept by someone he trusts because he knows that person will take good care of it. Michael did the same, choosing to transfer knowledge to a close friend outside the project he was leaving instead of keeping the knowledge within the project.

As a receiver, Jim says that his previous relationship as a contractor with a departing project member helped him during his transition into a position where he would replace this member. Departing members, in his experience, do not generally seek out a suitable receiver, because they are already thinking about their next job. They are, however, more likely to transfer knowledge when they are asked by someone they know.

Additionally, knowledge transfer may not occur at all if a good relationship has not yet been established. In the case of being a receiver, Michael says that his fellow project member who was leaving, only passed knowledge along because they had a good relationship.

> *"The only reason he was [transferring knowledge] was for me, not the*
> *company." (Michael)*

The importance of relationships even extends past the transfer phase. Toby makes it clear that he would probably only help after having left the project or company if he knows the person who was asking for help. He says, especially in situations where he leaves the company

entirely, that it would be strange to be asked for help after departure by someone he does not know (see Chapter 4.1.8 Contact After Transfer).

All interviewees agree that knowing someone makes the knowledge transfer much easier. Some even claim that knowing the other party is the single, most important issue when it comes to knowledge transfer. In order to trust someone with whom one does not have a relationship, one must judge him or her by his or her previous accomplishments, which is hard to do when first entering the project. Toby says that in one case, he relied on blind trust when accepting knowledge, because he did not know the sender at all. He states that this is not good practice, since he then does not question the knowledge he receives and just uses it blindly without completely understanding it.

## 4.2.2 Hierarchies

Positional hierarchies do not seem to be an issue, since the departing member is usually transferring knowledge to someone who is taking over his or her role in the project. Additionally, previously established relationships also overrule the potential problem of hierarchies. If there is a relationship, hierarchy does not matter.

> *"… whether or not I have a higher paygrade, I try to treat them as peers.*
> *Whereas, I do know that other people […] really do get off on position and*
> *they treat others accordingly. And I think that makes a big difference. I'm sure*
> *it does." (Stanley)*

Most interviewees agree that it is really an issue of the hierarchy related to knowledge accumulation than it is a hierarchy of position. They sometimes feel intimidated by someone with, for instance, decades of experience. However, it turns out that even hierarchies can prove to be a non-issue if there is a good relationship and mutual respect between the sender and receiver. On the other hand, learning and teaching between more and less knowledgeable project members can cause issues (see Chapter 4.2.7 Teaching and Learning Styles).

Interestingly, even in situations where the new project member is not yet hired at the time of departure of the old project member, positional hierarchy is ignored. The departing member finds someone else to whom to transfer knowledge and chooses this individual based on competence rather than hierarchy (see Chapter 4.2.4 Language and Understanding).

### 4.2.3 Incentives, Motivation, and Cooperation

All interviewees say there is no such thing as corporate incentives or any other incentives provided by management to encourage the departing member to transfer knowledge. In fact, most express confusion as it never occurred to them that such a system could actually exist. Ryan says that sometimes management will ask the departing member to stay a little while longer, especially if he or she is let go, so there is more time for the transfer to occur. None of the interviewees believe that a reward system meant to encourage knowledge transfer is implementable, simply because quantity and quality of the knowledge transferred cannot be regulated and mainly depends on the departing member's motivation. Even if it could be implemented and the amount of knowledge transferred could be measured, without personal drive, the transfer would be unlikely to occur, especially in the event of a departure under unfortunate circumstances.

As for motivation and cooperation, both are related to the willingness of the sender to transfer knowledge to the receiver. Both factors depend on the context of departure and are also heavily tied to relationships between senders and receivers (see Chapter 4.2.1 Trust and Relationships).

Motivation is a very personal thing. Being motivated to transfer knowledge depends heavily on the personality of the individual. Motivation can be driven by professional interests as well as passion about the project or job. However, this is an individual decision. The sender is generally already thinking about his or her next job and will not be interested in transferring knowledge, unless he or she has a passion for the work and wants his or her successor to have the same job satisfaction. Both motivation and cooperation drop significantly when the departing member leaves the company entirely because he or she no longer feels any need to contribute to the company. Oscar says that when somebody leaves the company, his or her motivation to transfer knowledge depends a lot on his or her personality.

In one such instance, as a departing project member, Michael was very motivated to transfer knowledge. Due to his passion for his job, he tried to make the transition as smooth as possible, so the project would not stall. Jim says that when he was receiving knowledge from a departing member, he noticed that the sender was very cooperative and motivated, because he was becoming overloaded with other projects and, thus, wanted to leave the project as soon as possible by transferring the knowledge as quickly and fully as possible.

Dwight says that he is more motivated to share knowledge with those around him whom he knows than with an arriving project member with whom he is not acquainted (see Chapter 4.2.1

Trust and Relationships). He also says that, in a particular situation where he was a receiver, there was some knowledge he was resistant to absorbing because he was not sure if it was really important to know. In this case, a very knowledgeable departing member was trying to impart knowledge that was sometimes a bit too detailed and superfluous.

Similarly, cooperation is also a matter of personality and can be related to the nature of the project member's departure. Jim says that he has witnessed disgruntled employees deleting everything on their computer following a lay-off. However, in situations where the member moves to another project but continues having the same manager, it is critical that the departing member remain professional and transfer knowledge appropriately.

As a frequent receiver of knowledge, Oscar says that his experience indicates that most departing members transfer knowledge out of sympathy for their successor, especially when they depart on a negative note. To confirm this sentiment, Jim, as a laid-off project member, says he did not have issues with other engineers, just with management.

*"The problem is with the company, not with the [new project member]."*

*(Oscar)*

Cooperation on the part of the sender does not necessarily mean initiation, however. Departing members are not likely to initiate the transfer and that the new member must put an effort into locating the source of the knowledge (see Chapter 4.2.6 Time and Priorities). Additionally, just because the sender exhibits cooperation during the transfer process, this does not mean he or she will be equally cooperative after the transfer period has expired. Stanley experienced resistance when being a receiver, as the departed member left behind documents that were difficult to understand and provided only minimal explanation when asked to clarify. As discussed later in Chapter 4.2.6 Time and Priorities, the sender may sometimes be prohibited from cooperating by management, because transferring knowledge requires time and that time may not be available if the departing member's time is split between several projects.

*"If you do not ask, they are not going to look for you." (Oscar)*

As for motivation and cooperation on the part of the receiver, generally, new project members are willing to learn. They are motivated because it is a new job for them and cooperative because it is necessary for them to learn from the predecessor so they can do their job well. However, there are some cases in which the receiver is not cooperative. Phyllis describes a situation in which the incoming project member refused to accept knowledge from her, because he felt his way of doing things was better than hers, even though she had more experience in

this specific field. Having too much knowledge as a receiver sometimes prohibits effective knowledge absorption because there is resistance to new knowledge.

## 4.2.4 Language and Understanding

Issues with technical language and technical understanding were investigated separately in the interviews. However, just like some other knowledge transfer factors, language and understanding were closely linked. Thus, they are combined in this chapter. Although the interviews were meant to focus only on the technological aspects of language and understanding, it turned out that spoken and written language was also a factor. Thus, results of both types of languages are presented here.

Since, generally, the successor of a departing member is hired into the role based on educational qualifications and prior experience, the new member usually has the necessary technical knowledge required to be able to understand the knowledge being transferred. However, this is not always the case. Even when the receiver's technical knowledge is at the right level, the departing member does not necessarily know to what extent that technical knowledge is related to the knowledge being transferred. Again, this points back to the importance of relationships and knowing the person beforehand (see Chapter 4.2.1 Trust and Relationships). The consensus among the interviewees seems to be that, at the very least, the sender must know what level of technical knowledge the receiver has.

> *"I do not know how many times I have done a spreadsheet and handed it off to someone [and] I thought 'this is great, this is better than sliced bread' and they never open it because it looks too complex." (Stanley)*

Additionally, having technical knowledge does not mean one has knowledge about the tools used in the project. For instance, in one particular case mentioned in an interview, the departing member had to transfer knowledge to someone who had never used a test tool before. This made it difficult to explain different testing procedures, since there was a lack of basic knowledge about the tool on the part of the receiver.

In some cases, it is not necessarily the technical knowledge that is lacking, but rather the soft skills. Another case involved the departing member having to transfer to someone who had been working as a low-level tester and did not interact with management or other project members very much. Here, the sender had to also transfer knowledge about how to communicate, which he had not expected to have to do.

It is revealed that many companies often have their own set of acronyms, so when knowledge is transferred, the sender must make sure not to use vocabulary, abbreviations, and acronyms with which the receiver is not familiar.

Unlike the example in Chapter 4.2.1 Trust and Relationships where Michael chose to transfer knowledge to someone with whom he had a close relationship instead of someone who was in the same project, Ryan, who was in a similar role to Michael's at the time, chose to impart knowledge upon someone who he was certain would be able to understand the knowledge. In other words, he chose someone with a specific technical background, demonstrating that technical background knowledge is a requirement for effective knowledge transfer.

Finally, written and spoken language is also a factor that influences knowledge transfer. Several interviewees express concern over having some minor issues communicating with their successors who are not completely fluent English. In one instance, one interviewee found it easier to communicate with the sender in his native language, which was not English.

## 4.2.5 Personal Competitive Advantage

As already discussed in Chapter 4.1.8 Contact After Transfer, the receiver sometimes refrains from sharing some knowledge for various reasons. It can be related to personality, the quantity of knowledge, or the type of knowledge.

My data shows that some people might keep knowledge to themselves because it means it will be more difficult for the company to fire them. This really only applies to cases where the departing project member stays within the company, since it would clearly hurt the company if he or she was let go. Withholding knowledge means that the new member will need to come back to the sender regularly to obtain the missing knowledge. This generally happens when the departing member wants to remain somewhat involved in the project he or she is leaving.

> *"If you want to still keep a foot in this [project], you might share but not 100%. Maybe not keep it, but do not mention it." (Ryan)*

Two interviewees explicitly say they generally do not actively try to keep knowledge to themselves, because they feel that doing so would not help enrich the industry and company. Both care more about the success of the project or company as a whole than about their own competitive advantage. However, the opposite can also occur; the sender may not transfer some knowledge because it is the sender's intent to hurt the project or company.

Sometimes, knowledge is withheld because it is too cumbersome or time-consuming to transfer it. Oscar, an application engineer, says that he does not normally protect knowledge for his own benefit. It is just simply too much to share sometimes. He says it is much faster for him to do it himself rather than try to explain how to do it. This ties back to the scenario mentioned in Chapter 4.1.8 Contact After Transfer where it is sometimes easier for the departed member to take care of making changes to spreadsheets than it is for him or her to transfer knowledge about it to the new member so the new member can do it him- or herself.

*"[Transferring the knowledge] would have just slowed us down." (Dwigt)*

Finally, in some cases, even though the departing member may want to share knowledge, he or she may be prohibited from doing so, because it is proprietary. Usually, though, this is not the case, since the departing member is training his or her successor who should be just as privy to this proprietary knowledge as is the departing member. Still, my empirical findings show it can happen.

## 4.2.6 Time and Priorities

Both the time allotted for knowledge transfer and the priority given to the transfer greatly affect the quality and quantity of the knowledge transfer. How much time the sender is able to spend transferring knowledge depends greatly on the sender's priorities. Hence, the data involving these factors are combined in this chapter.

Chapter 4.1.1 Transfer Training discusses how it is usually up to the receiver to seek out knowledge, but this requires skill in asking questions. The sender's time and responses are limited; the receiver must ask the right questions. The sender generally spends the last few weeks or days of his or her time finishing up projects. Consequently, the receiver must be aware of the fact that the sender is not going to be able to give all of his or her time to the transfer.

In lay-off situations, this time can be limited to just a single day. There is also the two weeks' notice time frame, generally occurring when a project member leaves voluntarily. Longer periods may occur if the movement of employees occurs internally or the departing member is particularly open about his or her future plans, such as was the case with Michael's acquaintance who gave a three months' notice.

One interviewee noted that priority is one of the biggest issues with knowledge transfer. How much time a departing member can dedicate to knowledge transfer is not always up to that member, however, and depends on the priority given to the transfer. As mentioned in Chapter

4.2.3 Incentives, Motivation, and Cooperation, an example of this is Ryan's case, where he moved from one project to another within the same company. The two projects had two different managers, so they had to come to an agreement about how much time Ryan was allowed to spend on transferring knowledge to the old group versus how much time he was to spend on receiving knowledge from a departing member in the new group. This became complicated when the old project was delayed, and he had to be called back to work on it full time for a couple weeks. This is an example of where both time and priority were involved. The old project had priority for a while, so he was permitted to redirect his attention to a position he had already left. Still, it is sometimes difficult to find a balance between teaching the old team and learning from the new team. This is something that can create tension between managers.

Time can have a significant impact on the decision of whether to transfer some knowledge versus some other knowledge. In Chapter 4.1.4 Types of Knowledge, I state that with a lack of time, only the bare necessities are transferred, mainly the knowledge of where information is located and who needs to be contacted.

> *"It is not like everybody is going to dump everything off their calendar [and teach you]." (Toby)*

Even when the sender can prioritize the knowledge transfer over his or her other work, the receiver may have issues absorbing knowledge and understanding it thoroughly. Oscar, as a frequent receiver of knowledge, makes the comment that it is nearly impossible to become proficient at the departing member's job over such a short period of time. It is very difficult to get to the knowledge level of someone with over a decade of experience in only a couple weeks.

Although some interviewees say that having enough time is the most important factor of knowledge transfer, unfortunately, even with infinite time at one's disposal, the knowledge transfer may not necessarily be a complete success. Even though one may have enough time, there are always things that the sender forgets to transfer.

## 4.2.7 Teaching and Learning Styles

Throughout the interview process, one topic that is not covered in the questions but emerges through discussion is different learning styles. One interviewee describes learning from two different people. He learned very well from the one who did not assume he was unintelligent, because he had a question about something simple. The other sender, however, was not as good at explaining things as was the other sender, because he assumed the receiver knew more than

he actually did (see Chapter 4.2.4 Language and Understanding. This has less to do with hierarchies of knowledge (see Chapter 4.2.2 Hierarchies) than it has to do with the sender's ability to teach, since both senders had approximately the same level of knowledge.

Sometimes it is difficult to determine how to teach someone when one does not know the receiver from previous interactions with him or her. It is difficult to uncover the receiver's personality or how he or she learns, and one does not always know how much knowledge the new member has already.

Phyllis discusses an interesting scenario in which she transferred the same knowledge twice. Her initial replacement left abruptly sometime after the transfer and was unable to transfer her knowledge to her successor. Instead, Phyllis transferred her knowledge again to the second recipient when she arrived. Phyllis quickly discovered that while the first transfer went very well, the second was much more difficult. The second receiver had a different style of learning and had to be taught differently.

> *"I could describe things to her one time, she would jot down her own notes in her own way and then the next day, she could do it on her own." (Phyllis)*

# 5. Analysis

Chapter 5 Analysis aims to combine theory from Chapter 2 Theoretical Foundation and empirical findings from Chapter 4 Empirical Findings to observe the applicability of the propositions listed in Chapter 2.4.4 Summary of Propositions. To remind, the purpose of this thesis is to apply the Ability-Motivation-Opportunity (AMO) model from Chapter 2.3 The Ability-Motivation-Opportunity Model and factors from Chapter 2.4 Knowledge Movement Factors to knowledge transfer during the departure of a project member in the semiconductor industry. I investigate whether the authors' claims about knowledge sharing are also applicable in situations they did not necessarily consider when developing said theories.

Chapter 1 Introduction presents the criteria which my analysis must meet in order to accept the AMO as likely applicable to knowledge transfer. Each of the three categories must have at least one factor remaining in it by the end of my analysis. Otherwise, I deem the basic structure of the AMO model irrelevant to knowledge transfer.

The following subchapters investigate each of the three categories in the AMO model to determine which factors are valid for knowledge transfer. Following this analysis, Chapter 6 Discussion presents a new model for knowledge transfer.

## 5.1 Ability

Propositions relating to the first of the three categories of the AMO model, ability, are discussed in the following subchapters. The three factors related to these propositions are positional hierarchies, common language, and technical competence of both the departing and incoming members.

### 5.1.1 Hierarchies

> Proposition A1: *In a transfer situation, positional hierarchy can sometimes be an issue.*

As discussed in Chapter 2.4.1 Ability, theory presents hierarchies as inhibiting knowledge sharing. I state in my proposition that this problem may also exist for knowledge transfer.

My findings in Chapter 4.2.2 Hierarchies do not reveal any evidence that supports this proposition. Interviewees were very clear that positional hierarchy was generally not a knowledge transfer inhibiter. I can see two reasons for this: the nature of the transfer and the nature of the semiconductor industry.

There are two scenarios to consider for the first reason: first, a new project member joins before the previous one departs and, second, there is no replacement for the departing project member at the time of departure. For the first case, my findings reveal that the new project member is usually at the same level as the departing member, since the new member is replacing the previous member. This means that even if there was hierarchical tension for knowledge sharing within the company or project, for that matter, it would not apply to the knowledge transfer process, because both sender and receiver are at the same hierarchical level. In the second situation, my findings indicate that the departing member chooses the receiver based on with whom he or she has a relationship, regardless of positional hierarchy. Basically, the relationship factor overrules potential issues with hierarchies.

As for the nature of the semiconductor industry, another reason for hierarchies being inconsequential is that positional hierarchies do not play a major role in how employees treat each other. Having previously worked in the semiconductor industry, I can say that in that industry, it seems that employees are respected for what they know and accomplish rather than for their job title or position within the company. I suspect that this phenomenon is specific to the semiconductor industry or perhaps highly innovative industries in general. My empirical findings indicate that it is not so much a positional hierarchy that is the problem; it is competence level. Thus, the scenario I bring up in Chapter 2.4.1 Ability of being intimidated by others higher up in the hierarchy is actually a misinterpretation on my part. It is the wealth of knowledge that the sender has that is intimidating and can therefore affect knowledge transfer.

To conclude, my findings indicate that positional hierarchies are of no consequence, particularly in the semiconductor industry. Thus, Proposition A1 should be revised, stating that hierarchies are not an issue when it comes to knowledge transfer.

## 5.1.2 Language

> Proposition A2: *In a transfer situation, lack of a common language or technical jargon can negatively impact knowledge transfer.*

Theory states that communication can be inhibited when there is no common language (see Chapter 2.4.1 Ability). I make the argument in my proposition that technical jargon in particular is important for effective knowledge transfer. In addition to written and spoken language and technical terms, the data collected in relation to this factor revealed a third type of language: acronyms.

Some interviewees experience issues with English written and spoken language. This is mostly due to the fact that the semiconductor industry uses China and other Asian countries for manufacturing. Thus, there is frequent communication between fabrication plants in China and the engineers in Europe and North America. Even communication between Europe and North America can be problematic. My research reveals that a possible solution to such a situation is to switch to one's own native language that is not English to communicate with one's counterparts in a non-English speaking country (see Chapter 4.2.4 Language and Understanding). This demonstrates that those involved in knowledge transfer are aware of these issues and try to find ways to minimize their impacts.

Issues with technical jargon are not so prevalent. Interviewees are more concerned about the new project member's competence rather than his or her detailed knowledge about technical terms. This is discussed in Chapter 5.1.3 Competence. Still, there are instances where the receiver lacks the necessary vocabulary to understand the functions of the machine he or she is learning about. In that case, the sender has to spend time teaching technical terms before being able to transfer knowledge about the machine and testing procedures.

The worst culprit with regard to unsuccessful knowledge transfer is acronyms. Different companies use different sets of acronyms and even within the same company, acronyms can have multiple meanings. They tend to be very specific to certain fields or projects, so it is highly unlikely the incoming project member will be aware of all of them. Additionally, the departing project member is likely fluent in these acronyms and during the transfer process must avoid using them at first yet also try to teach the new member about them.

Thus, I would argue that Proposition A2 holds true. In fact, acronyms should be added to the list of factors related to language.

## 5.1.3 Competence

> Proposition A3: *In a transfer situation, basic competencies of the sender and receiver should be matched as closely as possible.*

Theory suggests that efficient transfer between experts and novices is unlikely because experts sometimes have difficulty "stooping" to the competence level of novices (see Chapter 2.4.1 Ability). In my proposition, I suggest that in a transfer situation, this is also true, and it is easy to combat this by trying to match the competency levels of both parties involved in the transfer.

There are actually two reasons why competency levels should be matched. First, the sender is more likely to be able to relate to the receiver and be able to teach him or her. Second, the sender will not have to waste time teaching basic knowledge and can rather focus his or her time and resources on critical knowledge that is specific to the position within the project.

The first reason is supported by the data collected through the interviews. Being taught by someone who has far more experience is difficult, mainly because the sender may assume the receiver has more basic knowledge than he or she actually.

I have found that in the semiconductor industry, it is common to become an expert in one field. This, unfortunately, means that a departing project member is likely going to have years and years of experience and will find it difficult to teach an incoming member who may very well be a new college graduate with limited experience.

The importance of the latter of the two reasons is demonstrated by interviewees' recounts of times where they had to transfer to a different project member temporarily because the new one had not arrived yet. In addition to selecting someone they knew (see Chapter 4.2.1 Trust and Relationships), they also focused on the skill level and technical background of the receiver (see Chapter 4.2.3 Incentives, Motivation, and Cooperation).

My findings support the notion that the competency of the incoming project member must be sufficient for new knowledge to be built on it. Additionally, the departing project member must be aware that his or her replacement may not be as competent on certain subjects as expected and must therefore tailor his or her knowledge transfer to fit the capabilities of the receiver.

Based on theory and data, I would say Proposition A3 is accurate, as its suggestion covers both aspects of competency issues.

## *Summary*

Based on the analysis of the factors within the ability category of the AMO model, two propositions remain the same while one is slightly modified. Below in Table 4, the pre-analysis and post-analysis propositions are given. Basically, hierarchy is not an issue during transfer, several aspects of language affect transfer, and the competency levels of both parties can affect the transfer. The new propositions are further discussed in Chapter 6 Discussion for the purposes of creating a new AMO model specific to knowledge transfer.

Table 4 Analysis of Ability Propositions

|  | Pre-Analysis | Post-Analysis |
|---|---|---|
| Proposition A1 | *In a transfer situation, positional hierarchy can sometimes be an issue.* | *In a transfer situation, positional hierarchy is usually not an issue.* |
| Proposition A2 | *In a transfer situation, lack of a common language or technical jargon can negatively impact knowledge transfer.* | In a transfer situation, lack of a common written and spoken language, technical jargon, and acronyms can negatively impact knowledge transfer. |
| Proposition A3 | *In a transfer situation, basic competencies of the sender and receiver should be matched as closely as possible.* | <no change> |

## 5.2 Motivation

The following six subchapters examine the propositions relating to the factors included in the motivation category of the AMO model. To this category belong personal drive, trust between the sender and receiver, the relationship of the involved parties, incentives and rewards, cooperation of both the sender and receiver, and the withholding of knowledge on the part of the departing project member.

### 5.2.1 Drive

> Proposition M1: *In a transfer situation, knowledge transfer is unlikely to occur without the prerequisite of personal drive.*

My proposition for the drive factor indicates I agree with theory: personal drive is necessary for knowledge transfer to occur. My data seems to support this view. As one interviewee says, the departing member is much more willing to transfer knowledge if he or she is passionate about his or her role and wants his or her successor to enjoy the role as well and be just as successful as he or she was (see Chapter 4.2.3 Incentives, Motivation, and Cooperation).

This drive is particularly evident in situations where the departing member offers to stay in contact after the departure in case more knowledge transfer is required (see Chapter 4.1.8 Contact After Transfer).

Personal drive, or in other words, passion, can be so strong in some cases that it can sometimes outweigh any other factors that may otherwise contribute to the motivation of the departing member to transfer knowledge. Such was the case of several of Michael's departures from projects. His passion drove him to use any means necessary to transfer his knowledge before his departure and then continue to offer his support long after he had left the project. He even went as far as temporarily storing his knowledge in someone who was not even in the same project and did not have the same technical background (see Chapter 4.2.4 Language and Understanding).

Meanwhile, if personal drive is completely absent, knowledge transfer is basically impossible. People rarely do things unless it benefits them in at least a small way. When someone has no personal drive to transfer knowledge, it is probably because he or she sees no benefit for him- or herself in doing so. With the exception of external incentives, all other factors that create positive knowledge transfer build on drive.

Based on the emphasis on personality and personal motivation to transfer knowledge in the interviews, I suggest that Proposition M1 applies to knowledge transfer.

## 5.2.2 Trust

> Proposition M2: *In a transfer situation, trust between the sender and receiver has positive effects on knowledge transfer.*

As discussed in Chapter 2.4.2 Motivation, theory has conflicting views about the effects trust has on knowledge sharing. Taking these views into account, I decide in my proposition that during transfer, trust only has positive effects.

My empirical findings reveal that trust is an important factor of knowledge transfer, but there are arguments both for and against a higher level of trust having a positive impact on transfer.

The interviews reveal there are actually two types of trust. The type of trust that can have negative effects on knowledge transfer is blind trust. While this is mentioned only once in the interviews, I can imagine that blind trust is very common in transfer situations. Given that there is often very little time for the transfer to occur and new members may not know the departing member from previous interactions, blind trust is all the receiver can rely on. The higher that blind trust is, the less the receiver will question the knowledge being transferred.

While there is some evidence that higher levels of trust could have negative impacts on knowledge transfer, most examples illustrate positive impacts. Trust built on relationships can

increase knowledge transfer. In fact, this is most important when there is no replacement for the departing member and he or she needs to find alternative storage for the knowledge. In that case, empirical evidence shows that the project member chooses someone whom he or she trusts to take care of the knowledge.

Basically, there is a difference between trust built on a relationship and blind trust. The former supports my proposition while the latter does not. The type of trust present during a transfer greatly depends on whether a relationship has already been established. Thus, my proposition is neither right nor wrong. Proposition M2 must be modified to specify that of the two types of trust, only trust which has been established over some longer period of interaction between the sender and receiver has positive effects on knowledge transfer.

### 5.2.3 Relationships

> Proposition M3: *In a transfer situation, having a relationship between the sender and receiver makes the transfer more likely to occur.*

Knowledge sharing theories put much emphasis on relationships between the parties involved and I agree in my proposition that it is likely an important factor in transfer as well.

My empirical findings reveal that there appear to be four different scenarios in which previously established relationships are important: when the receiver must seek out the sender and actively ask for knowledge, when the sender is laid off, when there is no replacement for the sender, and when contact after the transfer is necessary. Most importantly, there are no indications at all that relationships are not important for knowledge transfer.

In Chapter 1 Introduction, I mention that knowledge movement in general is a social process, stating knowledge transfer requires interaction. Unfortunately, most of the knowledge transfers that occur in projects in the semiconductor industry involve engineers who are not particularly outgoing or extroverted people. Consequently, it makes sense that these project members are more likely to interact with people they already know rather than with people they do not know. Thus, it is not at all surprising that my findings state that senders often do not initiate the transfer. As evidence shows, the sender is more likely to acquiesce to the request for knowledge transfer if he or she already knows the receiver. It follows that in the common situation in which the sender initiates the transfer, previously established relationships enable such requests for knowledge.

Secondly, if the sender is not motivated to transfer knowledge because he or she is being laid off and is no longer interested in the success of the project, he or she will be more likely to transfer knowledge out of loyalty to or empathy for fellow project members or other coworkers, as described in Chapter 4.2.1 Trust and Relationships of my empirical findings.

In the third case, if properly motivated, the sender will seek out other project members or coworkers outside the project who can temporarily keep the knowledge until a new project member arrives. Again, my findings suggest that relationships are important in this case as well, since they seem to dictate whom the sender chooses as the recipient.

Finally, relationships are especially important when the departing member leaves the company entirely. My findings reveal that departed members are sometimes contacted after they leave (see Chapter 4.1.8 Contact After Transfer) the project and company, even though that is generally against company policy. However, contact is only ever initiated if there is a preexisting relationship between the departed member and the member asking for help.

Relationships also seemed to affect the sender and receiver equally. Every case described in the interviews where the interviewee joined a project, he or she was much more content with the quality and ease of the knowledge transfer process if he or she knew the departing member prior to the transfer, even if only very little.

Overall, my findings reveal that relationships are, in fact, one of the most important factors affecting knowledge transfer. Thus, Proposition M3 is supported by data. I would, however, emphasize the importance of relationships in the proposition, since my findings point to it as being the single most important factor affecting knowledge transfer.

## 5.2.4 Incentives

Proposition M4: *In a transfer situation, corporate incentives, such as public recognition or monetary rewards, may encourage knowledge transfer.*

Theory states that incentives can affect knowledge sharing positively, although it is not usually very effective. I propose that perhaps in a transfer situation, it is, in fact, beneficial.

My findings (see Chapter 4.2.3 Incentives, Motivation, and Cooperation) lean heavily towards there being no such incentive programs in the semiconductor industry. No interviewee had experienced being provided incentives to transfer knowledge and no one was aware of the existence of such a program. There were, however, some hints given as to why these programs

did not exist, which included the inability of management to measure knowledge transfer and the nature of the departure of the project member.

The first potential reason for a lack of incentive programs is that tacit knowledge is unmeasurable. Extra rewards within a project, for example, can be given if tasks are completed earlier than planned, at a lower cost, or at a higher quality. These characteristics can all be measured. Unfortunately, tacit knowledge cannot be measured, because it resides within an individual and is unknown to anyone else. Additionally, quantity of knowledge is not necessarily better than the quality or usefulness of the knowledge. Thus, it would be near impossible for management to assign discrete monetary values to this kind of immeasurable knowledge.

One could argue that knowledge transfer pertaining to very distinct tasks can be measured, such as teaching one's successor how to use test equipment. However, the extent of the knowledge about the test equipment cannot be measured. For instance, the sender may only transfer the bare necessities related to how the test equipment should be used and withhold knowledge about more efficient ways of testing.

The second reason why incentives are ineffective is that when a member leaves the company entirely, especially during unfortunate circumstances, it is unlikely that he or she will care about the future success of the company. Offering stocks in exchange for proper knowledge transfer would then be futile. It would be even more pointless if the departing member has malicious intentions and purposely withholds knowledge.

Despite revealing some reasons why incentives do not encourage knowledge transfer, my findings showed that there are other techniques used to incentivize the departing member. One related technique mentioned in the interviews to encourage knowledge transfer was having the departing member continue in his or her position for a period of time after the departure was supposed to occur to allow more time for knowledge transfer. This can be seen as a bribe of sorts. The departing member is provided an incentive to continue working (i.e. transferring knowledge): a salary for a little while longer. Again though, this only works if the departing member is sufficiently motivated, since neither the quantity nor the quality of knowledge transfer can be properly measured.

In conclusion, I would say that Proposition M4 needs to be negated. Incentives have little to no effect on knowledge transfer.

### 5.2.5 Cooperation

> Proposition M5: *In a transfer situation, both parties need to be willing to interact with each other to facilitate knowledge transfer.*

One important thing to consider here is that the receiver must be more than just cooperative; he or she may need to initiate. As one of the interviews reveals (see Chapter 4.2.3 Incentives, Motivation, and Cooperation), the departing project member usually lacks in motivation to transfer knowledge, so while he or she may be cooperative, the receiver must sometimes make the first move.

Unlike trust, cooperation is vital. This is evidenced by Phyllis' recount of when she was unable to properly transfer knowledge to someone because the receiver was unwilling to accept it. This seems to be a rare case, however, since other interviewees claim that incoming members are typically very cooperative, wanting to make a good first impression.

Meanwhile, it may be more difficult to get a departing member to be cooperative. If personal drive is relatively low, only the relationship with the incoming member, if one exists, may drive the knowledge transfer. Alternatively, the departing member may want to maintain a good reputation.

Data revealed that cooperation on the part of the sender may sometimes even be forced. As one interviewee recounts, he had to remain professional and be cooperative during the knowledge transfer when he was in a situation in which his manager remained the same while the departing member switched from one project to another. Clearly, management does have some power in a case such as this to influence knowledge transfer.

My findings seem to indicate that lack of cooperation is a major inhibitor of knowledge transfer but can potentially be influenced by management. While other factors tend to only affect the sender, cooperation is particularly important on the part of the receiver. Proposition M5 remains unchanged.

### 5.2.6 Withholding

> Proposition M6: *In a transfer situation, withholding knowledge is usually only of concern if the project member remains within the company after departure.*

Theory mentions job security as a reason for withholding knowledge and that it is common to want to retain one's personal competitive advantage by being the only one who is in possession of some type of knowledge. I believe that in transfer scenarios, withholding knowledge is really

only an issue when the departing member has reason to keep it for the sake of job security within the same company.

My findings reveal multiple reasons for why a departing member may refrain from sharing knowledge with the incoming project member (see Chapter 4.2.5 Personal Competitive Advantage). These reasons were specific to certain scenarios. These scenarios include the following from most to least common: the knowledge is too difficult to transfer, the sender wants to hurt the project and/or company, the sender wants to keep some responsibilities, the sender wants to maintain job security, and the sender is not allowed to transfer the knowledge.

First, withholding knowledge may be due to simply being unable to express it in the short amount of time given to the transfer. Even with enough time, some knowledge may never be expressed. As some interviewees said, it may just be too difficult to transfer, indicating that this type of tacit knowledge may not even be expressible through demonstration.

Second, malicious intentions may also cause withholding knowledge. In order to damage a project or even the company as a whole, the departing member may take knowledge with him or her. My empirical findings reveal such an event (see Chapter 4.2.3 Incentives, Motivation, and Cooperation) and I have also personally witnessed similar behavior.

Third, the sender may want to keep foot in door. There are a number of reasons why this might happen. My findings show that even those who are very willing to share knowledge in general might not transfer their knowledge when leaving a project because it would mean transferring their responsibility.

The fourth reason is withholding knowledge to maintain competitive advantage, which is only applicable as long as the departing member stays within the same company. Then again, several interviewees mention that this is not something they themselves would do, as they are more interested in helping the company grow than to maintain job security. Thus, my findings indicate that maintaining job security is not a very common reason.

Finally, some knowledge in a project may be considered proprietary, although it is unlikely that someone joining a project would be kept from knowing everything about the project. The interviews reveal, however, that although departing members are not allowed to use proprietary knowledge in future projects, especially outside the company, rules are sometimes bent, and certain parts of this knowledge may be used by the departed member. Thus, it is reasonable to assume that knowledge used by a departing member for the project may stem from proprietary knowledge gained prior to the project. In this situation, that knowledge may not be transferred

to the departing member's successor, since it was never official part of the project or derived from it (see Chapter 4.1.7 Use of Knowledge After Transfer).

Clearly, there is much more to the withholding factor than personal competitive advantage. Thus, I would rephrase Proposition M6 to state that withholding is, indeed, an issue when it comes to knowledge transfer but add that it depends on the intentions of the departing member and the type of knowledge. Maintaining job security is not as much of an issue as malicious intentions or difficulty of the transfer, however.

*Summary*

Based on the analysis of the factors within the motivation category of the AMO model, three propositions remain the same while the other three are slightly modified. Below in Table 5, the pre-analysis and post-analysis propositions are given. To summarize, knowledge transfer cannot exist without some sort of personal drive, trust established through relationships can increase knowledge transfer, and relationships are very powerful and can outweigh other factors that might otherwise affect the transfer negatively. Additionally, rewards are unlikely to motivate the sender, cooperation from both parties is required, and withholding of knowledge can be either intentional or unintentional. The new propositions are further discussed in Chapter 6 Discussion for the purposes of creating a new AMO model specific to knowledge transfer.

Table 5 Analysis of Motivation Propositions

|  | Pre-Analysis | Post-Analysis |
|---|---|---|
| Proposition M1 | *In a transfer situation, knowledge transfer is unlikely to occur without the prerequisite of personal drive.* | \<no change\> |
| Proposition M2 | *In a transfer situation, trust between the sender and receiver has positive effects on knowledge transfer.* | In a transfer situation, established trust between the sender and receiver has positive effects on knowledge transfer while blind trust does not. |
| Proposition M3 | *In a transfer situation, having a relationship between the sender and receiver makes the transfer more likely to occur.* | In a transfer situation, the relationship between the sender and receiver is a major factor for encouraging knowledge transfer and can outweigh other negative factors. |
| Proposition M4 | *In a transfer situation, corporate incentives, such as public recognition or monetary rewards, may encourage knowledge transfer.* | *In a transfer situation, corporate incentives, such as public recognition or monetary rewards, are not likely to encourage knowledge transfer.* |
| Proposition M5 | *In a transfer situation, both parties need to be willing to interact with each other to facilitate knowledge transfer.* | \<no change\> |
| Proposition M6 | *In a transfer situation, withholding knowledge is usually only of concern if the project member remains within the company after departure.* | In a transfer situation, both intentional and unintentional withholding knowledge can be an issue if the departure of the project member creates malicious intentions or the knowledge is too difficult to transfer, respectively. |

## 5.3 Opportunity

Finally, the propositions for opportunity, the third category of the AMO model are analyzed in the following subchapters. These include access to the knowledge source, time dedicated to the transfer, and the level of priority assigned to the transfer.

### 5.3.1 Access

> Proposition O1: *In a transfer situation, accessibility of the knowledge holder in terms of physical location makes the transfer more efficient.*

Theory emphasizes frequent communication as being an antecedent of spontaneous knowledge sharing. Of course, spontaneity does not apply to knowledge transfer, since transfer is a planned, one-time event. However, communication is still vital to the success of the transfer. Theory rightly states that communication becomes more difficult when the two involved parties are physically further apart. I incorporate this notion in my proposition, saying that knowledge transfer is more likely to be successful if the sender and receiver are physically near each other. My findings appear to support this idea.

For instance, sitting near the sender optimizes the transfer, because it is easy to find and contact the sender. As other interviewees also point out, since knowledge is usually transferred through hands-on learning, proximity is very important.

Not being in the same physical space requires communication through other mediums, such as phone calls or emails. In one of Ryan's cases, the company saw it productive to fly the departing member from Europe to North America in order to ease knowledge transfer and learning (see Chapter 4.1.6 Mediums Used During Transfer). Ryan also had to receive knowledge through phone calls, but he pointed out that this process is much slower and usually not nearly as effective as in-person discussions.

I believe this demonstrates that Proposition O1 is supported by data. Proximity between the sender and receiver is important.

### 5.3.2 Time

> Proposition O2: *In a transfer situation, time dedicated to knowledge transfer is of the essence.*

Theory states that for knowledge sharing, an increase in time spent on the activity means an increase in both the quantity and the quality of the knowledge shared (see Chapter 2.4.3

Opportunity). I agree in my proposition, saying that time is essential for proper knowledge transfer. The standard time between the announcement of departure is about two weeks. However, this can vary, and the time dedicated to knowledge transfer is often much less, as demonstrated by my findings (see Chapter 4.2.6 Time and Priorities).

As documented in Chapter 4.1.6 Mediums Used During Transfer, the transfer process generally requires hands-on training, given the nature of projects within the semiconductor industry. Unfortunately, my findings indicate that there is usually a lack of time, resulting in incomplete or poor-quality knowledge transfer.

Time is also one of the main restrictors of what kind of knowledge is actually transferred. The general consensus is that when time is lacking, knowledge about where information is located is the only type of knowledge transferred (see Chapter 4.1.4 Types of Knowledge). Knowledge transfer through hands-on training is rare in such cases.

This all makes time seem very important. Still, as already pointed out in Chapter 4.2.5 Personal Competitive Advantage, even enough time does not guarantee complete knowledge transfer. Thus, while time can restrict the amount of knowledge transferred, removing the factor of time completely from the equation does not guarantee complete knowledge transfer. Therefore, I would clarify in Proposition O2 that while time is important for knowledge transfer, emphasizing time over all other factors will not guarantee comprehensive knowledge transfer.

### 5.3.3 Priorities

> Proposition O3: *In a transfer situation, prioritization of the knowledge transfer must be given by and agreed on by management to make sure it actually occurs.*

Although theory does not discuss prioritization very much, it is clear that not setting priorities can let knowledge sharing slip through the cracks (see Chapter 2.4.3 Opportunity). My proposition says that management can control knowledge transfer by setting priorities, especially in situations where the sender or receiver lacks motivation to initiate the transfer.

Knowledge transfer must compete with other activities to be completed by the departing project member before departure. As my findings show, there is more than just knowledge transfer that must occur before the project member leaves, such as wrapping up other small projects. The project member him- or herself usually does not know what to prioritize and just does whatever he or she wants to do or finds easiest to complete.

For knowledge transfer to receive enough time and attention, it should receive temporary priority. My findings reveal that giving knowledge transfer priority is one of the most important issues (see Chapter 4.2.6 Time and Priorities). I would suggestion Proposition O3 remain unchanged.

*Summary*

Based on the analysis of the factors within the opportunity category of the AMO model, two propositions remain the same while one is slightly modified. Below in Table 6, the pre-analysis and post-analysis propositions are given. Physical accessibility to the sender optimizes efficiency. Although time enhances knowledge transfer, it does not guarantee it. Finally, management can encourage knowledge transfer and emphasize its importance by giving it priority for a short period of time. The new propositions are further discussed in Chapter 6 Discussion for the purposes of creating a new AMO model specific to knowledge transfer.

Table 6 Analysis of Opportunity Propositions

|  | Pre-Analysis | Post-Analysis |
|---|---|---|
| Proposition O1 | *In a transfer situation, accessibility of the knowledge holder in terms of physical location makes the transfer more efficient.* | &lt;no change&gt; |
| Proposition O2 | *In a transfer situation, time dedicated to knowledge transfer is of the essence.* | In a transfer situation, knowledge transfer requires time, although infinite time does not guarantee complete knowledge transfer. |
| Proposition O3 | *In a transfer situation, prioritization of the knowledge transfer must be given by and agreed on by management to make sure it actually occurs.* | &lt;no change&gt; |

Now that my empirical findings have been compared to theory and my propositions from Chapter 2 Theoretical Foundation, I move on to Chapter 6 Discussion where I discuss which factors are most important for knowledge transfer and construct a new model specific to knowledge transfer based on these observations.

# 6. Discussion

Chapter 6 Discussion aims to propose a new model for knowledge transfer based on the AMO model of knowledge sharing. Using the results of the analyses of the propositions in Chapter 5 Analysis, the applicability of the factors in each category of the AMO model to knowledge transfer is discussed. In addition to eliminating factors whose propositions are unsupported by my empirical findings, the remaining factors are ranked by perceived importance. My intention is to produce a model that can be used by project managers to set knowledge transfer up for success and monitor its progress. Providing a list of factors of which to be aware and prioritizing them based on how much of an effect they can have on knowledge transfer will allow the project manager to focus on all or only some of the factors, depending on the extent of his or her resources or control over the transfer.

- High impact: *drive, relationships, cooperation, and priorities*

- Medium impact: *competence, language, trust, withholding, time, and access*

- Not applicable: *hierarchies and incentives*

The factors are discussed in order of importance in the model. Figure 9 visually expresses the importance of each factor, where bolded factors are most important and cross-out factors are unnecessary or do not apply.
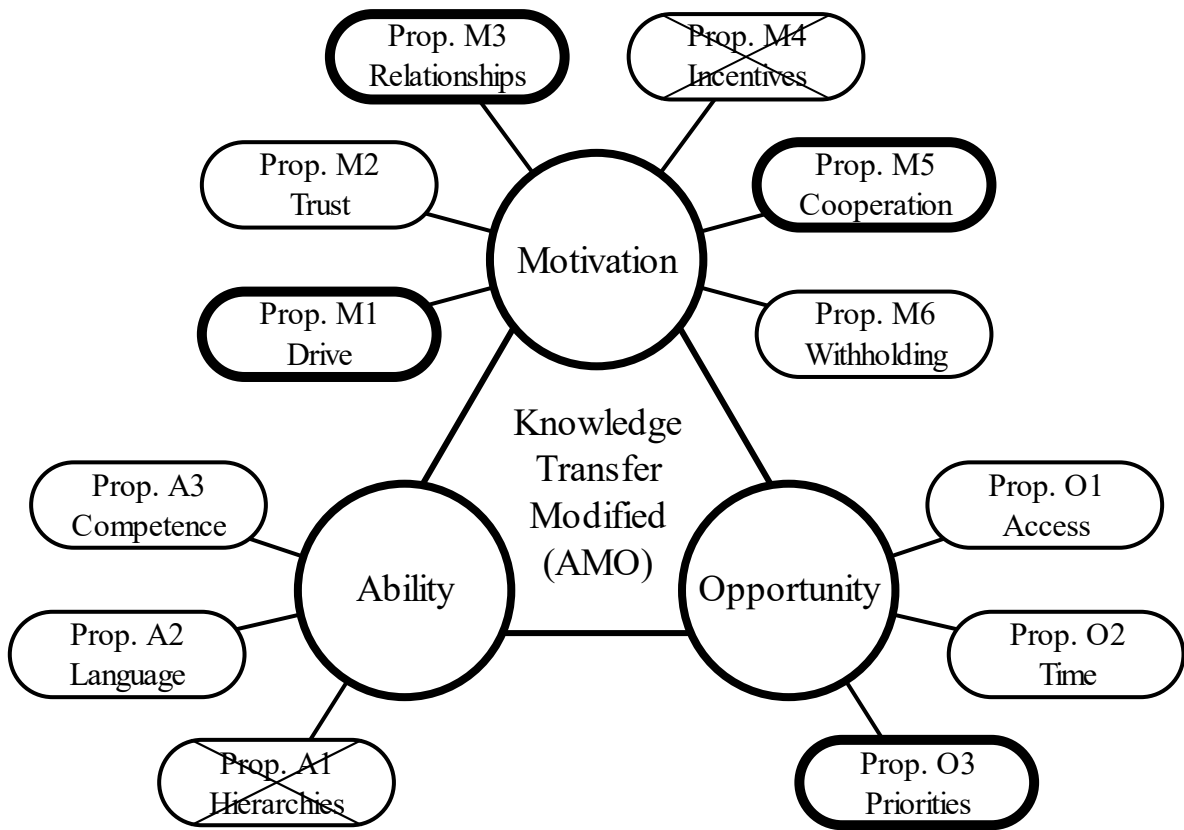
Figure 9 Revised AMO Model for Knowledge Transfer

## 6.1 High Impact

I find that the following four factors have the highest impact on knowledge transfer of all factors: drive, relationships, cooperation, and priorities.

*Drive*

Drive is probably the most important factor related to knowledge transfer. As Navimipour and Charband (2016) correctly state, intrinsic motivation encourages people to share knowledge. My research suggests that the same applies to transfer. Not only is intrinsic motivation a prerequisite to knowledge transfer, but this drive is also the cornerstone of all other factors that contribute positively to knowledge transfer.

Based on my findings, Ipe (2003) is absolutely correct in saying that people really only share when they possess personal motivation. The same applies to transfer, if not more so. During departure, there are many reasons not to transfer knowledge on the part of the sender and the departing member must be highly motivated somehow to take part in transferring knowledge. Thus, if there is one single factor management should be aware of, it is personal drive. Of course, anything that is personal is hard to influence. Management can combat this by hiring project members with a passion for their position or by creating a work environment that fosters

passion. Management should create an environment where project members will not want to leave or at least want to see the project be successful, even without their lasting involvement.

*Relationships*

The second important factor to consider is the relationship between the sender and receiver. In Chapter 5.2.3 Relationships, four different scenarios are mentioned in which relationships are useful and sometimes even critical. Even just the high level of frequency of the involvement of relationships in these scenarios is sufficient to say that relationships are incredibly important.

Both Argote et al. (2003) and Cabrera and Cabrera (2005) state that the willingness to share is increased by establishing relationships. This is equally applicable to knowledge transfer, since all examples given in the four scenarios tie back to a willingness to share which stems mainly from empathy for the departing member's successor or fellow coworkers.

Additionally, many other factors build on relationships. Established trust (see Chapter 6.2 Medium Impact) is a major factor that can only be created through a relationship. Some factors can even be overwritten, so to speak, by relationships. One of these is the withholding of knowledge (see Chapter 6.2 Medium Impact). Chow and Chan (2008) say that relationships can enhance sharing behavior; the same applies even more so to knowledge transfer. If withholding knowledge is avoided by having a relationship, this clearly enhances knowledge transfer. The departing member might be torn between wanting to hurt the project by withholding knowledge but also not wanting his or her fellow coworkers, and particularly his or her replacement, to suffer the consequences of doing so. Even if the departing project member is no longer loyal to his or her manager, the project, or the company as a whole, he or she is likely to still be loyal to his or her fellow project members.

I do not believe authors investigating relationships in knowledge movement scenarios consider the incredible impact relationships have on knowledge transfer. Not having an established relationship between the departing project member and the receiver of the knowledge could cause knowledge loss of sizable proportions. This is especially true when a project member leaves the company. The only factor that positively influences knowledge transfer is a previously established relationship.

*Cooperation*

The third high-impact factor is cooperation on both the part of the receiver and the sender. Collins and Smith (2006) state that both cooperation and trust are needed to create an environment where sharing is encouraged. However, my research shows that cooperation is

significantly more important than trust, so while the authors' theory may apply to sharing, it is not accurate for transfer.

Meanwhile, both Collins and Smith (2006) and Chow and Chan (2008) say that cooperation stems from fostering good relationships. This is also in line with my research. As stated in previous chapters, relationships have a significant impact on knowledge transfer. Thus, it follows that cooperation also affects knowledge transfer.

Argote et al. (2003) and Argote and Fahrenkopf (2016) bring up the idea that project members are cooperative about sharing knowledge when their reputation is at stake. My research shows that this is most definitely relevant to knowledge transfer as well. Thus, all authors are on the right track, although during transfer, it appears that cooperation is not on the same level as trust.

### *Priorities*

Finally, the most important factor in the opportunity category is priorities. There appear to be two scenarios in which setting of priorities is important. One is during the transfer period and the other is after the member has left the project. I address the latter first.

While there is not much knowledge sharing or movement theory that mentions the setting of priorities as being important, Hansen et al. (1999) are on point. The authors say that if priorities are not properly set, management will engage in battle over resources without considering the needs of others. An example in my findings (see Chapter 4.2.6 Time and Priorities) demonstrates this; when a project member moves from one project to another within the same company, the transfer of responsibilities is not immediate. The project member may need to continue transferring knowledge about the old project while starting to work on the new project simultaneously. To keep the project member from being overloaded, management must agree on how much of the project member's time should be spent on which project.

The setting of priorities must also occur during the transfer period before the project member departs. As is stated multiple times throughout this thesis, departing project members have other tasks to complete in addition to transferring knowledge. They often prioritize easy tasks or tasks they are actually interested in completely. Unless management clearly states that knowledge transfer has priority, the project member is left to his or her own devices.

What makes the priority factor so important and special is that management has absolute control over it. This is the one factor that allows management to enforce knowledge transfer to at least some extent.

## 6.2 Medium Impact

I determine the following six factors to have medium impact on knowledge transfer: language, competence, trust, withholding, time, and access.

### *Language*

The first somewhat important factor for knowledge transfer is shared language. Shared language appears to be a common factor between knowledge sharing and knowledge transfer. In Chapter 5.1.2 Language, I bring up three aspects of language, only two of which are covered in the theory I present in Chapter 2.4.1 Ability. I would consider each aspect of language to be on a different level, which would explain why acronyms are not specifically referred to in discussions about common language.

Cabrera and Cabrera (2005) discuss what I would consider the top-level aspect of language: spoken and written world language. This applies to all industries and all types of knowledge movement, since it is a requirement for communication in general. As already mentioned in Chapter 5.1.2 Language, the semiconductor industry operates globally and has most of its manufacturing activities in Asian countries. Theory proposed by Cabrera and Cabrera (2005) is therefore applicable to knowledge transfer in the semiconductor industry.

Meanwhile, Carlile (2004) goes one deeper, saying that technical jargon is considered language and is also important for knowledge sharing. Technical terms are present in most specialized industries, with the semiconductor industry being no exception. My findings show the importance of technical language to be just as applicable to transfer as it is to sharing, showing that the theory about technical language that Carlile (2004) presents applies to both types of knowledge movement.

Finally, what neither Cabrera and Cabrera (2005) nor Carlile (2004) consider is acronyms. This is likely because all authors focus on knowledge movement rather than the industry in which this process occurs. Acronyms are used in very specific disciplines and can have different meanings in different companies or even project.

Clearly, when it comes to language, it is the industry that determines which aspects of language are relevant. Knowledge sharing versus knowledge transfer is irrelevant as the importance of language is demonstrated in both types of knowledge movement.

*Competence*

The second factor of medium impact is competence. As already stated in Chapter 5.1.3 Competence, there are two aspects to competence. First, there is the issue of the new member not having the proper background to understand the knowledge being transferred to him or her by the departing member. There is not much theory about knowledge movement and this aspect of competence, perhaps because it is a very simple concept. However, it can definitely be an issue if the new member that is hired to replace the departing member does not have enough experience or no experience in the particular field in which he or she is now expected to work. Managers can mitigate this issue by selecting the replacement member carefully based on qualifications. Additionally, managers should make sure the departing member knows the technical background of the new member so how the knowledge is transferred can be tailored to suit the needs of this individual.

The second aspect of competence is what Hinds et al. (2001) describe. The authors point out that highly competent experts can have difficulties teaching novices. While Hinds et al. (2001) may be correct about it being a somewhat important factor of knowledge sharing, it is even more critical during knowledge transfer. During sharing, the sender chooses the recipient, while during transfer, the sender is generally forced to teach only one person: the new project member. As demonstrated by my findings, lack of competence of the new member or the lack of a new member can drive the departing member to seek a knowledge depository elsewhere. Management has less control in this area, since the extent of the ability of an expert to teach a novice is up to the expert. Still, hiring a new member based on the previous aspect of competence will also reduce the impact of the expert-novice teaching problem.

*Trust*

The third factor of medium importance is trust. The kind of trust that is useful for knowledge transfer is established trust rather than blind trust (see Chapter 5.2.2 Trust). Trust is in the medium impact category because I found it to only be present if a relationship has also been established.

Trust is usually developed over time and is heavily linked to relationships. When transfer occurs in a very limited amount of time, which is often the case, trust between the sender and receiver will likely not be very high, unless a positive relationship has already been established prior to the transfer (see Chapter 5.2.3 Relationships). Trust makes transfer easier, but it is not necessarily required for the transfer to occur or even be successful.

Theory presented by McNeish and Singh Mann (2010), (Navimipour and Charband, 2016), and Quigley et al. (2007) about knowledge sharing or movement in general also applies to knowledge transfer. Navimipour and Charband (2016) state that project members share knowledge when they trust each other; my findings support this sentiment. Also, when a departing member trusts an incoming member, he or she believes the receiver will take care of the knowledge, just like Quigley et al. (2007) state. Trust is particularly helpful when time is short, because, as McNeish and Singh Mann (2010) theorize, the receiver can then accept knowledge without having to factcheck it.

Blind trust, on the other hand, is bad trust. This is the type of trust that Szulanski et al. (2004) refer to when they argue that trust can have negative impacts on knowledge sharing. Blindly accepting knowledge is not ideal. Unfortunately, it is easy to take everything at face value and trust the source completely if one is unable to judge the trustworthiness of the source for oneself. That results in potentially misunderstanding the knowledge or not understanding it completely, because there is little reason to question the validity knowledge when the validity of the source is not questioned either. This impedes the effectiveness of the transfer, leaving the new project member with incomplete knowledge and no way to clarify it after the departing member has left.

One final thing to note about trust, is what Khvatova and Block (2017) propose about trust being a prerequisite for social interaction. The common thread throughout this thesis is the concept of knowledge transfer requiring hands-on training. This requires social interaction, so it follows that theory presented by Khvatova and Block (2017) about knowledge sharing is equally applicable to knowledge transfer.

I believe that established trust is a good "add on", so to speak, to relationships. However, trust generally appears to only be important for the sender when there is no replacement for him or her. Then the sender must find someone he or she trusts to take care of the transferred knowledge. Since trust is developed between individuals, management has very little influence on this factor. However, it can attempt to foster a culture where trust is valued and also hire from within.

*Withholding*

Yet another factor that is somewhat important to consider in a transfer scenario is the withholding of knowledge by the departing member. Interestingly, theory only touches on one reason for withholding knowledge: personal competitive advantage. Ipe (2003) mentions the

value of the individual, Riege (2005) focuses on career advancement, and Collins and Smith (2006) discuss job security.

Of the five reasons for withholding knowledge I identify in Chapter 5.2.6 Withholding, withholding knowledge for the purposes of what these authors mention is second least common. Perhaps Riege (2005) is partially correct in saying that it used to be that knowledge was withheld for the sake of increasing one's ability to climb the corporate ladder. Nowadays, at least in transfer scenarios, this does not appear to be the case.

The authors make no distinction between the types of knowledge involved, which explains why their reasons for withholding knowledge do not include the difficulty of conveying the knowledge. I specifically observed tacit knowledge in this thesis, and it becomes very clear in my research that tacit knowledge is simply too difficult to transfer sometimes.

My finding that knowledge is often withheld by the departing member so he or she keeps some responsibilities in the project he or she is leaving makes it clear that the authors are discussing only knowledge sharing, not knowledge transfer. This is a phenomenon specific to knowledge transfer.

In conclusion, it appears that literature discussing reasons for withholding knowledge ignores some very important distinctions, mainly tactic versus explicit knowledge and sharing versus transfer. This is made clear by my examples in the previous two paragraphs; the authors' treatment of withholding knowledge makes clear that an in-depth look at tacit knowledge and transfer scenarios are not included in their research.

Although the tendency to withhold knowledge is heavily linked to personality, which is not likely to be influenced by the project manager, what project managers should focus on is making sure the departure is amicable, so as not to give the departing project member a reason to hurt the project or company by withholding knowledge.

*Time*

The second to last somewhat important factor is the amount of time given to knowledge transfer. In knowledge sharing situation or knowledge movement activities in general, authors, such as Bartol and Srivastava (2002), Navimipour and Charband (2016), Riege (2005), Siemsen et al. (2008) appear to agree that time is of significant consequence and my research shows similar sentiments.

Since my findings reveal that transfer of knowledge normally occurs during and is most effective through hands-on training and such training requires time, it follows that time is critical for proper knowledge transfer. Additionally, since the opportunity to transfer knowledge is restricted by a start and end date, the time that is available for transfer must be utilized to its fullest potential. This is not the case for knowledge sharing, because sharing occurs over an extended period of time and is thus much more flexible. For instance, Bartol and Srivastava (2002) state that collaboration during knowledge sharing takes time, yet the authors do not make a distinction between sharing and transfer and thus do not make it clear that time is even more critical during knowledge transfer. Likewise, Cabrera and Cabrera (2005) suggest that spending more time together promotes communication and, consequently, better knowledge sharing. However, in a transfer scenario, the sender and receiver lack the luxury of being able to spend time together over a longer period to foster better communication.

Thus, it seems that while literature does put a substantial emphasis on time, it is even more critical during transfer scenarios.

*Access*

Finally, access also has a moderate effect on knowledge transfer. As Argote et al. (2003) rightly state, reducing distance increases opportunity and can also affect relationships and trust (see Chapter 6.1 High Impact and Chapter 6.2 Medium Impact, respectively). Riege (2005) comments that the frequency of knowledge sharing is reduced when spontaneity is reduced. Spontaneity is restricted by the location, because the further the sender and receiver are apart, the more the knowledge transfer sessions need to be scheduled.

In Chapter 5.3.1 Access, I claim that this spontaneity is not as applicable to transfer as it is to sharing, since transfer is a one-time event. However, spontaneity on a smaller scale is still applicable for other reasons. The ability of the receiver to spontaneously ask the sender for help or clarification is vital.

Basically, theory presented by Riege (2005) on knowledge sharing is applicable to knowledge transfer but in a much more specific way. Each type of knowledge movement treats spontaneity differently. In a sharing scenario, there is usually no deadline for sharing knowledge. One project member may encounter something that he or she thinks may be helpful to another project member, but he or she may delay sharing the knowledge because of other commitments and priorities. The knowledge is eventually shared spontaneously when the project member finds the opportune moment to share it. Meanwhile, in a transfer situation, there is a time limit

for requesting or submitting knowledge. The new project member may be working through a practice problem and may discover a gap in his or her knowledge. The departing project member is then sought out immediately in order to fill that gap as soon as possible. Likewise, the departing member may recall something he or she failed to transmit and then contacts the new member immediately. Thus, when Riege (2005) says that moving the sender and receiver physically closer increases spontaneity and, consequently, increases knowledge sharing, a similar concept applies to knowledge transfer, except that how spontaneity is treated is different in these two cases.

Based on my findings, it seems that management already recognizes location as affecting knowledge transfer. Just like with setting of priorities (see Chapter 6.1 High Impact), management has the ability to solve the problem of location by moving the sender and receiver closer together, even if it means flying the departing member out to the sender or vice versa.

## 6.3 Not applicable

There are two factors that I determine to be inapplicable to knowledge transfer scenarios in the semiconductor industry. These are hierarchies and incentives; they are described in this chapter and compared to theory.

### *Hierarchies*

The first of the two irrelevant factors for knowledge transfer is positional hierarchies. In Chapter 5.1.1 Hierarchies, I discuss several reasons for why hierarchies generally do not negatively interfere with knowledge transfer. The new project member is hired into the same position that the old member was occupying, relationships with fellow project members at different hierarchy levels overrule potential issues created by hierarchies, and hierarchies in the semiconductor industry are of little consequence, since coworkers tend to respect each other for each other's knowledge rather than position or pay scale.

Joia and Lemos (2010), Tsai (2002), and Wang and Noe (2010) all argue that hierarchies have negative effects on knowledge sharing (see Chapter 2.4.1 Ability). According to my analysis, their assessment of the effects of hierarchies does not apply in the context of knowledge transfer. Wang and Noe (2010), however, are on the right track when they say that positions should be deemphasized to promote sharing. The same applies to knowledge transfer, although in the case of the departure of a project member, this seems to happen automatically. Since treating hierarchies as inconsequential to knowledge transfer is an involuntary behavior, it is not something that project managers have control over or even need to consider when

monitoring knowledge transfer. Of course, my observation of knowledge transfer is in a very specific field, so this factor may play a role in other fields.

*Incentives*

The second irrelevant factor is incentives. In Chapter 5.2.4 Incentives I compare my empirical findings to the proposition from Chapter 2.4.2 Motivation, which reveals several reasons for the lack of reward systems but also possible alternatives.

Bartol and Srivastava (2002) and Foss et al. (2009) both stated that incentives and rewards can be used to encourage knowledge sharing. In Chapter 2.4.2 Motivation I list four main types of incentives presented by the aforementioned authors: monetary rewards, gift certificates, company stocks, and public praise. In Chapter 5.2.4 Incentives I discuss monetary rewards, which include gift certificates, and company stocks, arguing that these are irrelevant incentives for knowledge transfer in the semiconductor industry. Even public praise is not likely to encourage proper knowledge transfer, since the departing member leaves the project and no longer benefits from recognition given by other project members. Given that none of these incentives appear to apply to knowledge transfer, it seems that theory presented by Bartol and Srivastava (2002) and Foss et al. (2009) only applies to knowledge sharing and not to knowledge transfer.

Likewise, theory proposed by Cabrera and Cabrera (2005) does not apply to all forms of knowledge movement. The authors claim that rewarding knowledge sharing creates a culture that encourages future knowledge sharing. Since knowledge sharing is a continuous process, this may very well work in this kind of situation, since it fosters a culture of sharing within the project or organization. While creating such a culture might change a project member's attitude toward knowledge transfer in a positive way, the culture surrounding knowledge transfer is not affected directly by rewards, because the transfer event is a one-time event and not continuous.

Meanwhile, Quigley et al. (2007) and Riege (2005) present theory about incentives that is more in line with knowledge transfer: trust and relationships are more important (see Chapter 6.2 Medium Impact and Chapter 6.1 High Impact, respectively).

It seems clear that even though managers may have the resources available to provide incentives like monetary rewards, implementing a rewards system is nearly impossible and is not likely to result in any improvements in either quantity or quality of the knowledge transfer.

## 6.4 The Transfer Ability-Motivation-Opportunity Model

Three of the four most important factors fall into the motivation category. Thus, motivation appears to be the most important category. The fourth factor is in the opportunity category and all factors in the ability category are less important. Thus, I propose renaming the model from AMO to MOA to indicate the level of importance of each category. Additionally, a "T" is appended to remind that this is a model specifically for knowledge transfer, rather than knowledge sharing. Figure 10 below shows my final Motivation-Opportunity-Ability model for knowledge transfer (MOAT).
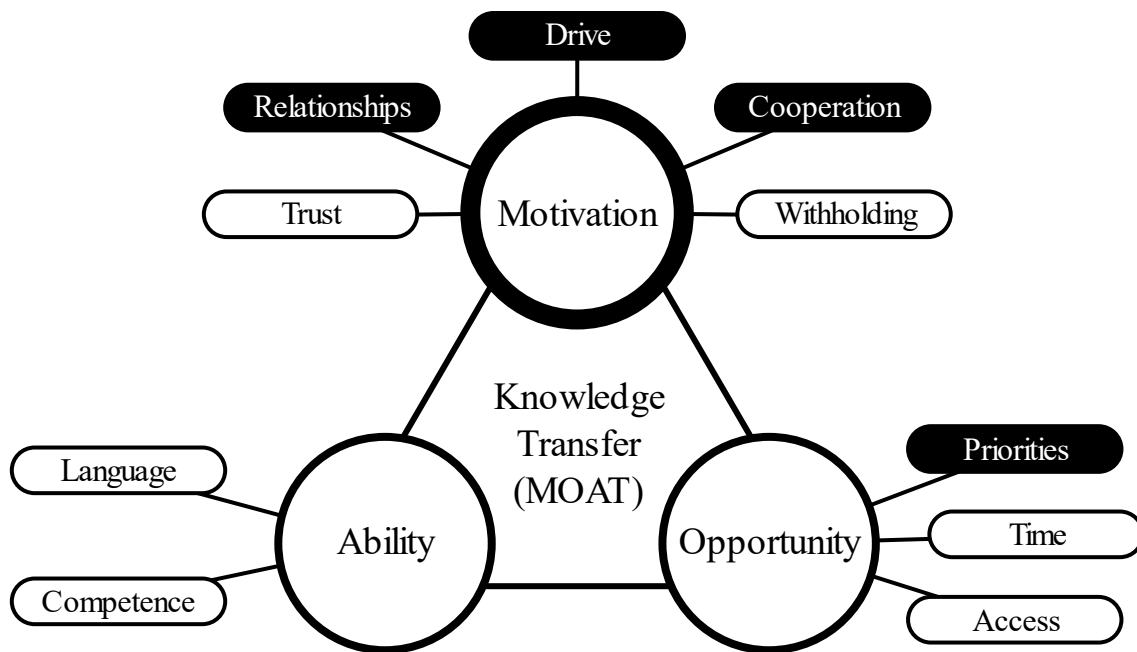


Figure 10 Final Motivation-Opportunity-Ability Model for Knowledge Transfer

In Chapter 7 Conclusion, I discuss how project managers can use this model to prepare for and monitor knowledge transfer in order to keep their projects from being affected by knowledge loss.

# 7. Conclusion

The purpose of this thesis is to investigate how knowledge is transferred when a project member leaves a project before the project has been completed and how this process can be improved. This purpose is summarized by the research question:

> *How do the factors of the AMO model for knowledge sharing apply to knowledge transfer during the departure of a project member in the semiconductor industry?*

My research shows that the factors applies to knowledge transfer in varying degrees and does not necessarily match what theory claims to apply to knowledge sharing or movement in general. Clearly, the factors of the AMO model apply differently to knowledge transfer than to knowledge sharing. Drive, relationships, cooperation, and priorities have the highest impact on knowledge transfer. Competence, language, trust, withholding, time, and access moderately affect knowledge transfer. And finally, hierarchies and incentives do not apply to knowledge transfer, at least not in the case I examined in the semiconductor industry. The basic AMO model still applies to knowledge transfer, although some modifications have to be made to make it more specific to knowledge transfer, resulting in the MOAT model (see Chapter 6.4 The Transfer Ability-Motivation-Opportunity Model).

## 7.1 Theoretical Implications

Although my primary aim for this thesis is to present a practical model for project managers or managers in general to use when preparing for and monitoring knowledge transfer (see Chapter 7.2 Practical Implications), I also make some theoretical contributions.

In the field of knowledge management, I demonstrate that there is a difference between knowledge sharing and knowledge transfer and that each type of knowledge movement should be treated differently. This is clearly demonstrated by the fact that several authors present theory about knowledge movement that does not apply to knowledge transfer, according to my findings. For instance, both Bartol and Srivastava (2002) and Foss et al. (2009) mention incentives that I show are not relevant to knowledge transfer, which demonstrates that sharing and transfer are different.

Another important theoretical contribution to knowledge management is the idea that of the three categories in the MOAT model, motivation is the most important category. Although the

original AMO model appears to attribute equal value to all three categories, applying it to knowledge transfer clearly shows that some are more important than others.

My findings indicate that knowledge management is important part of project management. New or incoming project members often struggle to obtain the knowledge needed to quickly get up to speed on the project. As my discussion of the various factors implies, project managers have control over at least some of these factors and can potentially implement methods which mitigate or even eliminate threats to knowledge retention. Activities related to prevention of knowledge loss are often ignored by both project managers and literature, even though, according to my findings, they seem to have an impact on the success of the project.

Finally, my findings also indicate that knowledge transfer is very much focused on the individual. This is demonstrated by the weight given to personal drive and motivation in general when it comes to transferring knowledge. Without the willingness to transfer, it does not occur. This suggests that characteristics of knowledge transfer extend into the field of psychology, as it is up to the individual to take the initiative and follow through with the transfer.

## 7.2 Practical Implications

In terms of practical implications for project managers, I draw attention to the issues surrounding knowledge and show that knowledge retention is often mismanaged during projects. To address this problem, I propose a model to be used by practitioners to prepare for and monitor knowledge transfer in the event of the departure of a project member. In particular, I identify the most important factors related to knowledge transfer, so project managers can focus on a limited set of issues in case of scarcity of resources. This is all summarized in a new model I construct, the MOAT model, that can be applied to practical situations and also in future case studies in other industries (see Chapter 7.4 Future Research).

Despite the intense focus on the individual, project managers still have the power to create a culture that encourages personal motivation that, in turn, positively affects knowledge transfer. Unfortunately, project managers have little direct control over the most important factors of knowledge transfer in my model. Nevertheless, in addition to being an effective leader and setting good examples, there are some activities that can be completed by project managers that can help encourage transfer. The following checklist in Table 7 shows how I, as a project manager, would address each influenceable factor. The factors are listed in the order in which I would address them, which is based on both the importance of the factor and its

influenceability. Although I would consider these activities to be more like guidelines than actual rules, they can help project managers address the issue of knowledge transfer in a systematic way.

Table 7 Checklist for Project Managers

| | |
|---|---|
| ☐ | Set knowledge transfer activities as top *priorities*. |
| ☐ | Maximize the amount of *time* the departing project member and the new project member can spend together. |
| ☐ | Ensure that the departing project member and the new project member have *access* to each other by locating them near each other. |
| ☐ | Decrease the chances of the departing project member *withholding* knowledge by avoiding creating an unamicable departure. |
| ☐ | Foster good working *relationships* within the team and loyalty among project members. |
| ☐ | Create an environment that fosters personal *drive* within project members, so they will not want to leave the project or still want the project to be successful, even when it proceeds without them. |
| ☐ | Hire from within to take advantage of the *trust* between the departing project member and the new project member. |
| ☐ | Match the *competence* levels of the departing project member and the new project member as closely as possible. |
| ☐ | Limit the use of acronyms and provide an acronym glossary for new project members to decrease the impacts of non-shared *language*. |
| ☐ | Encourage *cooperation* by creating a culture where project members are open to teaching and hire new project members who are open to learning. |

## 7.3 Limitations

Convenience sampling was the necessary method for data collection in this thesis (see Chapter 3.3.1 Selection Process). This is because I had limited time to secure and conduct interviews. Additionally, I preferred to conduct as many interviews in person as possible, and I had limited time at the location. This limited the number of interviews I could conduct. Additionally,

interviewing project members in different industries would have been interesting, but I was limited by time and resources.

Being well-acquainted with the interviewees can have negative consequences (see Chapter 3.3 Data Collection). This results in having much irrelevant data due to going off on tangents during the interviews and potentially interpreting the interviewees' comments differently than if I had not known them previously. I had wanted to interview others with whom I did not have prior contact, but I was unable to secure those interviews. Thus, my data may be a bit selective, because I interviewed people whom I respect and, thus, would have characteristics consistent with only positive aspects of knowledge transfer and good behavior.

## 7.4 Future Research

To test my MOAT model more meticulously, it may be beneficial to apply it to other high-tech industries that deal with projects. The projects that my interviewees describe are mostly short-term projects that only lasted a year or two. Longer-term projects with higher personnel turnover may show different results.

As for the specifics of the model, there are some additional factors that can be observed. In my research, I omit the culture factor due to time constraints (see Chapter 2.4 Knowledge Movement Factors). This is actually a very interesting factor and likely falls under either the ability category. If the new research remains in the semiconductor industry, it would be interesting to interview candidates from other countries, such as Asia. Here, language is likely a much bigger factor and culture probably has an impact as well. Also in the ability category is transfer experience, which I also omit (see Chapter 2.4.1 Ability). Data can be collected on how many times each interviewee went through a transfer situation and it could be investigated whether consequent transfers were more efficient or effective than earlier ones.

Regarding the design of and methods used during future research, I believe the research design should remain the same in subsequent research based on my thesis. I do not think that a quantitative research design is appropriate for research that observes situations from a psychological point of view. Numbers and statistic are not particularly helpful here, since the focus is more on the individual. Additionally, I recommend using the same methods for collecting data as I did: interviews. I do not believe that using a survey with no one-on-one interaction reveals very much about each transfer scenario. The questions need to be very specific. Not doing so can result in loss of unanticipated perspectives on the transfer.

Finally, based on the theoretical and practical implications mentioned previously (see Chapter 7.1 Theoretical Implications and Chapter 7.2 Practical Implications) I make the following suggestions for specific research, not directly related to my MOAT model.

Possible research question 1:

*Are extrinsic incentives and rewards still effective for encouraging knowledge sharing and/or knowledge transfer?*

Bartol and Srivastava (2002) and Foss et al. (2009) claim that rewards positively influence knowledge movement, yet my research shows that this does not apply to knowledge transfer. Perhaps this concept is outdated and also no longer applies to knowledge sharing.

Possible research question 2:

*How can the categories of the Ability-Motivation-Opportunity model be ranked by importance for knowledge sharing?*

My research clearly shows that motivation is the most important category in my MOAT model. The categories in the AMO model are not ranked for knowledge sharing. Perhaps investigating the importance of each factor could result in more in-depth theories about knowledge transfer.

Possible research question 3:

*How does knowledge transfer theory on the level of the individual apply to knowledge sharing?*

I have shown that some knowledge sharing theories apply to knowledge transfer while others do not when approaching it from an individual's perspective. Literature tends to observe knowledge sharing from an organizational point of view. Perhaps if knowledge sharing is researched with the individual in mind, knowledge transfer theories will be found to apply to knowledge sharing.

Possible research question 4:

*What psychological aspects apply to knowledge sharing and/or knowledge transfer?*

Motivation, according to my findings, seems to be the most important category of factors affecting knowledge transfer. Motivation is something observed in the field of psychology. Perhaps there are additional concepts found in psychology that apply to either knowledge sharing, knowledge transfer, or both types of knowledge movement.

Possible research question 5:

*How can the factors of the MOAT model be addressed in practice?*

The first step in approaching an issue is to identify the problem. I identify the problem of knowledge transfer and what can affect it in my MOAT model. The next step is to find ways to address these problems. While I give some brief recommendations on how to do so, these guidelines have not yet been applied in practice to determine whether they are actually feasible. Perhaps more research can be conducted on a practical level about how to manage the impact these factors can have on knowledge transfer.

## 7.5 Concluding Remarks

As important as knowledge is in a project, my findings suggest that it is not valued by project managers and companies in general. Given the concerns expressed by my interviewees, it is clear that those involved in the transfer are aware of its importance. Yet, project managers rarely engage in activities that promote knowledge movement and, in particular, knowledge transfer.

My findings in my research indicate that knowledge transfer, occurring during the departure of a project member, is not an easy or straight-forward procedure. Additionally, I discover that theories claimed to apply to all forms of knowledge movement are not all applicable to knowledge transfer, specifically. If project managers apply current theories on knowledge movement to their knowledge transfer situations, it is unlikely they will succeed.

The Motivation-Opportunity-Ability Knowledge Transfer (MOAT) model I develop based on my findings in the semiconductor industry, offers a more specific approach to handling knowledge transfer. Factors that apply to knowledge sharing but not to knowledge transfer are eliminated and the remaining factors are ranked by how much they can affect knowledge transfer. This MOAT model also provides the theoretical foundation for the set of guidelines I create for project managers to use to tackle the issue of knowledge transfer. Armed with this new tool for handling knowledge transfer, project managers can remove obstacles that may prevent the retention of knowledge and then focus their efforts on maintaining the scope, cost, and quality of their project while driving it completion.

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# Appendix

## Interview Questions (Sender's Point of View)

### *Background information*

1. What is your educational and career background?

2. How often are you in situations where you or someone else leaves a project?

3. What kind of knowledge transferring experience did you already have?

### *Background about the specific event*

4. How long were you part of the project before leaving?

5. At what point in the project did you leave?

6. How soon did you start thinking about what you had to transfer?

7. How long before you left did you start transferring knowledge?

8. Did you stay within the company or leave entirely?

9. Did the receiver join the project or was the receiver already part of it?

### *Process*

10. Did you share knowledge regularly before starting the transferring process?

11. Did you continue using that same knowledge in your new position or do you think you'll use it in the future?

12. What kind of training or previous experience did you have with transferring or receiving knowledge at the time of the transfer?

13. What mediums were used to facilitate the transfer?

14. Did you learn anything or gain more knowledge as you were transferring knowledge?

15. What kind of contact occurred after you left?

### *Specifics*

16. How well did you know the receiver and kind of interactions did you have with the receiver?

17. Was the receiver on a different level in the hierarchy? How comfortable were you with transferring the information?

18. How confident were you that the receiver would understand your knowledge and be able to use it?

19. How willing were you to transfer the knowledge? Did you care about the outcome?

20. How cooperative did the receiver seem to be? Did the receiver seem to care about the outcome?

21. What kind of benefits did you receive from transferring the knowledge?

22. To what extent, if any, did you fail to transfer knowledge because you felt it would affect your personal competitive advantage?

### *Wrap up*

23. How successful do you think the transfer was?

24. What do you think could have been done better?

## Interview Questions (Receiver's Point of View)

### *Background information*

1. What is your educational and career background?

2. How often are you in situations where you or someone else leaves a project?

3. What kind of knowledge transferring experience did you already have?

### *Background about the specific event*

4. Did you join the project or were you already part of it?

5. How long were you part of the project before the sender left?

6. At what point in the project did the sender leave?

7. How long before the sender left did the sender start transferring knowledge?

8. Did the sender stay within the company or leave entirely?

### *Process*

9. Did you share knowledge regularly before starting the transferring process?

10. What kind of training or previous experience did you have with transferring or receiving knowledge at the time of the transfer?

11. What mediums were used to facilitate the transfer?

12. What kind of contact occurred after the sender left?

## *Specifics*

13. How well did you know the sender and kind of interactions did you have with the sender?

14. Was the sender on a different level in the hierarchy? How comfortable were you with receiving the information?

15. How confident were you that you would understand the sender and be able to use the knowledge?

16. How willing were you to receive the knowledge? Did you care about the outcome?

17. How cooperative did the sender seem to be? Did the sender seem to care about the outcome?

18. What kind of benefits did you receive from receiving the knowledge?

19. To what extent, if any, did you feel the sender failed to transfer knowledge because the sender may have felt it would affect their personal competitive advantage?

## *Wrap up*

20. How successful do you think the transfer was?

21. What do you think could have been done better?